Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

NUARY 1, 1945
LUME 34, No. 1

AMERICAN DYESTUFF REPORTER

A DU PONT DEVELOPMENT
THE PAD-STEAM
CONTINUOUS DYEING PROCESS
VAT COLOR REDUCTION AND FIXATION IN A FEW SECONDS
This new process offers improvements which it is believed will minimize variables and mechanical difficulties that have limited the use of vat colors. It has already been put to successful practice by several processors.
The advantages of the new Pad-Steam Process might be summarized as follows:
1. The full range of vat colors may be applied continuously in pastel to very deep shades on a wide variety of fabrics.
2. Appearance, color yield and fastness properties of dyeings are at least equal to the best commercial work by current methods.
3. Substantial savings are possible in cost of color application.
4. The process is suitable for short as well as long yardages.
5. Close shade control is maintained, even in short runs, since no boosters are required.
6. Exhaustion problems and related difficulties in conventional dyeing are eliminated.
Du Pont Dyestuffs
BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY
DU PONT DYESTUFFS
E. I. DU PONT DE NEMOURS & CO. (INC.) DYESTUFFS DIV., WILMINGTON, DEL.

ICIAL PUBLICATION
of the
PROCEEDINGS
RICAN ASSOCIATION
TEXTILE CHEMISTS
AND COLORISTS

1945

May the New Year bring America a renewed spirit of faith and hope -- a deeper appreciation of the inestimable value of loyal friendship -- a unity of purpose that will hasten the day of final victory.

ALTHOUSE CHEMICAL CO.

READING, PA.

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

JANUARY 1, 1945

Officers of the Association

WILLIAM D. APPEL, *President*
National Bureau of Standards, Washington, D. C.

HUGH CHRISTISON—CHARLES A. SEIBERT, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline Division, Allied Chemical & Dye Corp., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass

LOUIS A. OLNEY
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

COUNCILORS

Representing Sections

HOWARD V. KING; BEN VERITY (Rhode Island)
JAMES P. CONAWAY; GLEN S. HIERS; BOYCE C. BOND (Philadelphia)
KENNETH H. BARNARD; PATRICK J. KENNEDY; ROY G. BUCK; LEONARD S. LITTLE; THOMAS F. O'BRIEN (New York)
EDWARD S. CHAPIN; HARRY M. HARTNETT; CHARLES H. A. SCHMITT (N. New England)
C. NORRIS RABOLD; R. E. RUPP (Piedmont)
ROBERT W. PHILIP (South Eastern)
JACK ANDERSON (South Central)
HERBERT W. TETZLAFF; ARTHUR T. BRAINERD (Midwest)

Past Presidents

ELVIN H. KILLHEFFER; P. J. WOOD; ROBERT E. ROSE; WILLIAM H. CADY; ALBAN EAVENSON; CARL Z. DRAVES; THOMAS R. SMITH

Standing Committees of the Council and their Chairmen

Executive Committee on Research
Leonard S. Little, Chairman

Publicity
Henry F. Herrmann, Chairman

Appropriations
William R. Moorhouse, Chairman

Membership and Local Sections
Hugh Christison, Chairman

Publications
Louis A. Olney, Chairman

Corporate Memberships
Henry F. Herrmann, Chairman

Local Sections and Their Officers

Northern New England Section

Delbert E. Ray, Chairman, Massachusetts Mohair Plush Co. Western Ave., Lowell, Mass.
Azel W. Mack, Secretary, Hart Products Corp., 176 Federal St., Boston, Mass.
G. Clifford Emmons, Vice-Chairman; George O. Linberg, Treasurer

Rhode Island Section

Harold B. Sturtevant, Chairman, 44 Brookside Dr., Cranston, R. I.
Robert W. Joerger, Secretary, Institute Lane, North Scituate, R. I.
George H. Wood, Jr., Vice-Chairman; Robert R. Farwell, Treasurer

New York Section

Emmett J. Driscoll, Chairman, Turner-Halsey Co. 40 Worth St., New York, N. Y.
Norman A. Johnson, Secretary, American Dyestuff Reporter, One Madison Ave., New York 10, N. Y.
Dr. Herman E. Hager, Vice-Chairman; Paul J. Luck, Treasurer

Philadelphia Section

Arthur W. Etchells, Chairman, Hellwig Dyeing Corp., Delaware Ave. and Comly St., Philadelphia, Pa.
A. E. Raimo, Secretary, John Campbell & Co., S. E. Corner Broad and Spring Garden Sts., Philadelphia 23, Pa.
Curt R. Baeringer, Vice-Chairman; W. F. Fancourt, 3rd, Treasurer

Piedmont Section

Sidney M. Cone, Chairman, Proximity Manufacturing Co., Greensboro, N. C.
John B. Neely, Secretary, Burlington Mills, Yarn Dyeing Div., Burlington, N. C.
Leland C. Atkins, Vice-Chairman; Wyss L. Barker, Treasurer

South Central Section

Homer Whelchel, Chairman, Central Franklin Process Co., Chattanooga, Tenn.
R. W. Freeze, Secretary, American Aniline Products, Inc., 2202 Chamberlain Ave. Chattanooga, Tenn
J. A. Crumley, Vice-Chairman; W. K. Newman, Treasurer

Midwest Section

Virgil T. Hartquist, Chairman, Wayne Knitting Mills, Fort Wayne, Ind.
Louis Hoehn, Jr., Secretary, Nyanza Color & Chemical Co. 549 West Randolph St., Chicago, Ill.
George E. Osha, Vice-Chairman; Alfred J. Olson, Treasurer

South-Eastern Section

O. G. Edwards, Chairman, Avondale Mills, Sylacauga, Ala.
W. B. Griffin, Secretary, Kali Manufacturing Co., 939 Highland Terrace, N. E. Atlanta, Ga.
J. E. Smenner, Vice-Chairman; Laurie E. Whittelsey, Treasurer

STUDENT CHAPTERS

Lowell Textile Institute
North Carolina State College
Philadelphia Textile Institute
New Bedford Textile School

Members should notify the **Secretary** immediately of all address changes.

THE TEXTILE CHEMIST IN THE POST WAR WORLD*

WILLIAM D. APPEL
Presiding

PRESIDENT APPEL: Members and guests of the AATCC. This is the official opening of the 1944 Annual Meeting, and it is the first such meeting since 1941. I want to welcome you to the meeting and to express the hope of the Association and the Council that you will find not only technical help and inspiration here, but a chance to renew old friendships and make new ones. While this is strictly a technical meeting, in tune with the times, planned deliberately to avoid use of hotel facilities and travel facilities that would hinder the war effort, we hope you will find it stimulating and that you will go home with renewed energy for your work.

The AATCC has over 400 members in the military forces of the United States, which is over 10 per cent of its membership. We at home are vitally concerned with what these members are doing in Europe and in the Pacific area. We are equally concerned with what we can do for them tomorrow when they return to civilian life. The personnel service inaugurated yesterday is a new departure from the activities of the Association, designed to serve alike our individual members and our corporate members. It will be of special value to our member veterans when they return from the war.

This symposium on "The Textile Chemist in the Post-War World" is another evidence of our interest in the welfare of our members and in the future of textile chemistry.

Technological developments in the industry point the need for highly trained personnel who, under present conditions, are not forthcoming from colleges and emphasize the importance of the subject.

Before calling on the speakers who have prepared papers for this program, I want to introduce the man who is responsible for organizing it. He is an organic chemist and engineer, well known to most of you for his enthusiasm and his leadership. He is also responsible for the organization and starting of our personnel service. He has been a member of the duPont Company since he received his Ph.D from Minnesota in 1927, and he has recently been made director of the technical laboratory of E. I. duPont de Nemours & Company, Inc. I hope he will say a word to you about how this symposium came about.

Dr. Miles A. Dahlen!

DR. MILES A. DAHLEN: This particular part of the technical program was my idea.

Three years have gone by and a lot of things have happened. Some of us think we shall go back to the same kind of working conditions that we had in the past; others of us think differently.

We do know that the simple textile industry of some years ago—cotton, wool, silk—was messed up a bit with viscose and acetate, and now we have nylon and Aralac and many other synthetics. We know the post-war period is going to use all of these fibers, alone and in mixtures. It is going to require a lot more technical effort, a lot more technically-trained men than we have ever had before to really make use of this opportunity.

Another thing that we know has happened in these last three years is the development of a new spirit of research in the textile industry. Many of the plants have organized new laboratories, others are expanding their existing facilities. Several new, very large research institutes have been formed; and on top of that, the organizations which produce chemical raw materials for the industries also have elaborate plans for increased research.

Again, we are going to have to have highly skilled men to really make these plans work.

We know, too, that we are going to have a new kind of competition. In the future I think the competition in technical results, in making use of our modern products and modern methods, is going to be as important as price competition. Again, that means technically trained men.

In planning the meeting, we decided that there were many misunderstandings throughout the technical world and certainly in the business world as to what will be the employment situation after this war. Maybe we shall have a lot of unemployment in operating personnel, but we know that there will certainly not be unemployment of any good technical men. We have a very severe shortage today, and that shortage is going to continue for many years. I don't want to anticipate what some of the others on the program are going to say.

We also know there is going to be a lot of competition, just as there is today, between various organizations in hiring the few good men that are available. We know, also, that the textile industry's reputation in securing technical men perhaps is not as good as that of the petroleum industry, the chemical manufacturing industry, and certain others. You may all remember that during the last World War we had a very serious shortage of organic chemists and chemists in general. To build up our big chemical industry we also had to build up chemical education, and the late Francis Garvan was more or less the godfather of our chemical profession. He gave enough money so that there was publicity in the high schools and elsewhere, and as a result the number of chemical graduates was increased tremendously. Still, we have never had too many.

Maybe we need some kind of a godfather to encourage more men to go into textile chemistry. I don't know who it will be, but it probably will be a good idea.

Also, we know that much of the new research is of such a type that men with post-graduate training will be needed in increasing numbers. Masters and Doctor's Degrees, I think, will be far more common in the textile industry in the years to come than they have been in the past.

All I am doing is posing a few problems, and I think they are so serious that consultation is in order. I think that we need the advice of others, those who are qualified to think about these problems but who aren't too close to them, and so we have called in the specialists. We have three eminent specialists with us this afternoon who will be introduced by Mr. Appel.

PRESIDENT APPEL: Our first speaker is a man who has served science and industry and education in many capacities. He is a member of some 16 national scientific organizations. He is a research chemist and has been chief chemist in the United States Bureau of Mines and As-

* Symposium at Annual Meeting, Atlantic City, N. J., October 13, 1944.

sistant Director of the Fixed Nitrogen Research Laboratory of the Department of Agriculture. He received the Nichols Medal of the New York Section of the American Chemical Society in 1926. He has been on the faculties of the Massachusetts Institute of Technology, University of Michigan, and the University of Minnesota, and at the present time he is Dean of the Institute of Technology of the University of Minnesota. Dr. Samuel C. Lind will speak on "The Undergraduate Course in Textile Chemistry."

Dr. Lind!

DR. SAMUEL C. LIND: I think your Association does very well at this time to interest yourselves in and devote attention to the question of your future chemical employees. I say that for two reasons: because I am sure that your future justifies this interest and because there are certain problems that we hope to develop here today that are common to all employers of chemists. In this competition that Dr. Dahlen has mentioned for chemists, the technical employees, you will find that any attention that you devote to it now will justify itself.

. . . Dr. Lind then presented his prepared paper. . . .

THE UNDERGRADUATE COURSE IN TEXTILE CHEMISTRY*

S. C. LIND

Dean of the Institute of Technology, University of Minnesota

THE close relation that must exist between chemistry and the textile industry was fully appreciated in the formation of your Association and was recognized in your constitution which states that the objects of your Association are: "to promote increase of knowledge of the application of dyes and chemicals in the Textile Industry" and "to encourage in any practical way research work on chemical processes and materials of importance to the Textile Industry." No broader invitation could have been extended to chemistry to enter and dominate your industry. It is not a case of the camel first getting his nose under the side of the tent. You foresaw the importance of chemistry and opened the front door wide. In fact, chemists are now the main supports of the tent and a very large spread it has.

It is therefore with much pleasure that I accepted the invitation of Dr. Dahlen to speak to you on the undergraduate training of a chemist. I undertake this with all the more enthusiasm since I am convinced, as no doubt you also are, that the textile industry has entered a new era of unbounded horizons, a period of expanding development in which it must go hand in hand with chemistry; and not only with chemistry but a chemistry of the most modern type. And chemistry itself is in the midst of a great and rapid period of development with which chemical education must keep pace to furnish the leaders for this advance.

In an earlier period in the textile industry the chemist was called upon to treat or process pre-existing materials. Today he creates new synthetic materials and adds them to the list of fibers or fabrics to be chemically treated. The chemist's responsibilities have been greatly increased. He studies the inter-molecular structure of natural and synthetic fibers, he modifies them chemically to fit the special use in hand, he makes new synthetic fibers from an ever increasing wealth of materials and with an ever expanding and more refined technique. His training must be correspondingly enlarged and broadened to cover thoroughly the fields of modern chemistry and physics. For this reason we must re-examine the basic training on which his further development must depend.

I shall expressly confine this analysis to the undergraduate course since Professor Taylor will discuss graduate work and research. I am sure, however, that you appreciate the close connection between all these and that you realize that undergraduate training must give an adequate foundation on which to build research.

Before beginning on the details of the education of a chemist I believe we may well give some attention to the present and future supply of chemists as it is being, and for some time will continue to be affected by the war. Briefly I can say that chemists are about as scarce as nylon stockings,—but with a difference. Nylon stockings will come back after the close of the war much quicker than chemists. Probably most of you realize that since early this year the supply of chemists has been entirely cut off at the source. No students of chemistry or other sciences are now left in college except those not yet 18, a few over 26 who are completing graduate work while carrying on some essential war research, and a few IV-F's.

There will be no more normal sized graduating classes until three or four years after the war. The education of scientists in the United States has been sabotaged for the duration. No field of education has suffered so much as science and the applied sciences, including engineering.

At the beginning of the war and even before our entry into it, the value of science and engineering in the war effort and particularly on the industrial front at home was definitely recognized by Selective Service. Provision was made for the deferment of students in the fields essential to war production, operation and research. This put chemistry, physics, and engineering in a preferred position similar to that of Medicine and Dentistry, but in sharp contrast with Law, Education, Business and the Humanities.

But as the war has lengthened, draft policies have become progressively more stringent until the sciences now find themselves facing a very serious situation. Deprived of all student deferment, which is still extended in enhanced numbers to Medicine, Dentistry, Osteopathy and Veterinary Surgery; and having little or no enrollment of women, the enrollment of students in the sciences is reduced to a few per cent of normal. As I have said, this condition appears likely to prevail for the duration of the war, with the result that the normal number of graduates will not again be reached for several years after the close of the war. In about 1948-1950 our modern chemical industries will have an annual supply of new chemical graduates about equal to that in 1890. Graduate work in chemistry has also been totally disrupted. Owing to the length of time it will take to re-establish the carefully balanced system of assistants and graduate students, neither will graduate work nor research be quickly restored to their former status.

To be more specific about the imminence and seriousness of the approaching shortage of chemists let us look at the situation at the beginning of the present war. Data of the American Chemical Society showed that in a normal year there were about 3,300 graduates of accredited four-year courses in chemistry and chemical engineering in the United States. It now seems likely that this number will be reduced to about one-tenth for a period of at least three years and possibly longer. At a minimum this will mean a shortage of about 9,000 chemists and chemical en-

* Presented at the Annual Meeting, Atlantic City, N. J., October 13, 1944.

gineers or nearly a three years' supply.

And who can say that the number of graduates will come back to normal in three years? The recently announced policy of Selective Service contemplates the continued drafting of the 18-year olds as replacements for the men overseas who have had several years of service. Such a policy may prolong the period of restoration to normal by several more years.

And even before the war the number of chemists and chemical engineers graduating from accredited colleges was not nearly sufficient to meet our needs. But you may say the Roster reported the annual graduation of about 2,000 chemical engineers and 6,000 chemists. Will these graduates from unaccredited institutions not take up the slack? No, for two reasons. Their numbers have also been and will continue to be decimated by the draft. And even if they were not, the 2,000 chemical engineers are not much above the total of 1,653 from accredited institutions. And while the 6,000 chemistry majors were far above the 1,653 from accredited departments, many of these "chemistry majors" were really pre-medical, predental, pre-pharmacy or other pre-professional students not headed toward professional chemistry at all. Furthermore, the fact that the balance of the unaccredited chemists was absorbed by industry shows that the supply of adequately trained chemists was far below our needs even in prewar times. How much greater the accumulated deficiency will be in the post-war period needs no lengthy calculation.

Moreover, our national educational policies in comparison with those of the nations with which we must compete after the war leave much to be desired. Only about one-fifth of our high school graduates reach the university at all. The distribution with reference to ability is sad to contemplate. Of the top 10 per cent, only one out of two go to college. Out of the top 30 per cent only one in three. Of those students that enter college to study science or technology only one in two or even three graduate and of those who do, only one-half graduate in the normal four years.

Reports coming out of Russia before and during the war indicate a much greater appreciation of higher training in technology. When we were setting a quota of 10,000 students in science and technology, Russia was reported to have 50,000 in training. And to show the supreme contempt which we had for science, our quota, one month after its adoption, was completely abolished. England has taken to heart her bitter experiences of the last war and protected her scientists and students of science in the present war. No one knows what Germany's policy has been, but it may well prove to have been a much wiser one than ours, which will enhance our dangers in post-war competition. In Canada the number of students in science and engineering was doubled during the same two-year period when ours was being cut to half and now to one-tenth of normal.

I have made these gloomy statements not at all to convey the idea that chemistry in this country is going into a decline or that it will suffer any permanent set-back due to the war. Quite the contrary. I am convinced that not only will its progress again be accelerated as it was following the last war, but again it will be the chemical industry that will lead in recovery and that will lend firmness to our entire industrial structure.

But there must be a temporary period of several years during which there will be a real scarcity of well-trained chemists of all varieties. Textile chemists will be no exception. Let me exhort you to use them wisely, treat them well, keep them happy and you will be rewarded.

At the outset of this discussion of courses in the field of chemistry please let me make it clear that I shall not attempt to tell you what kind of course you should require of chemists who will serve you in those parts of your field which have already been thoroughly explored and reduced to routine practice. You are already familiar with chemists who have had this type of training. There are several schools in the country that are well equipped to train such specialists. My object is rather to present the kind of curriculum which experience and good authority have shown to be best fitted for the basic training of an all-round, non-specialized chemist who can either go on into graduate work in some field of specialization or enter industry equipped to solve the problems that will present themselves in an ever shifting scene of rapid development and keen industrial competition.

It will be you, as leaders in this Association of chemists in one of our most basic industries, who must evaluate the relative merits of this or that type of training and place the men you receive into their proper places. It is you who will then be able to judge what training best meets your needs. I am sure you will find there is no substitute for a sound basic course.

For the past several years the American Chemical Society has recommended certain minimum requirements for the professional training of chemists, with which you may be more or less familiar. The increasing number of institutions that have adopted these requirements and which have been found able to meet them attests to their wide applicability. I cannot do better than to recommend them to your attention in some detail.

In chemistry four fundamental fields should be covered in the undergraduate course: inorganic, organic, analytical and physical chemistry with some attention to industrial chemistry.

A minimum of 30 weeks of instruction is required in each of the following six subjects: (1) general inorganic chemistry (three hours of lecture or recitation and four to six hours of laboratory per week); (2) quantitative analysis† (with not less than eight hours of laboratory per week); (3) physical chemistry (three lectures and at least three hours of laboratory per week); (4) organic chemistry (three lectures and five to six hours of laboratory per week); (5) advanced chemistry in any of the four fundamental fields of chemistry or in biochemistry which must follow two full years of chemistry (two lectures and three to four hours of laboratory per week); and (6) physics (three lectures and three hours of laboratory per week).

In mathematics all requirements comprise the equivalent of two years of college work which must include one year of differential and integral calculus.

In foreign languages a reading knowledge of German or French is required with German preferred. This is the equivalent of two years of college instruction in one of the two, but it is highly desirable that a student of chemistry have a reading knowledge of both German and French.

In the English language one year of composition is required which should include the writing of technical reports. While it has not been required by the American Chemical Society, the present trend is to put a great deal of emphasis on some training in public speaking. This may be included in the course in English when provision for an independent course in speech cannot be made. The disappearance of the old debating societies of a generation ago has left a vacancy in our educational system which can only be filled by the introduction of some systematic training in public speaking. Practice in writing reports is also a very essential part of the training of any industrial chemist.

The Humanities are receiving a great deal of attention just at present by those responsible for the curricula of students of science and technology. The American Chemical Society requires at least the equivalent of one-half of a student's residence time for one year to be devoted to the study of humanities, interpreted as non-specialized courses other than the physical sciences and exclusive of the required English and other languages.

† Qualitative analysis may be included in general chemistry or distributed between it and quantitative analysis.

The Committee on Engineering Education After the War of the Society for the Promotion of Engineering Education has gone even further in its report to the Society at its recent meeting in Cincinnati (*J. Eng. Education*, 34, 589, May 1944). It recommends the inclusion in the four-year undergraduate course of a minimum requiring approximately 20 per cent of the students' time to be devoted to humanistic-social studies in a designed sequence of courses extending throughout the four undergraduate years.

This desire on the part of some or demand on the part of others that students in the fields of science and technology should have more than a passing knowledge of the humanities and the social sciences is not new. The urge arises from many varied sources. There is the old claim, not well supported by statistics, that scientists and engineers are not cultured and need a dose of humanistics for their own good.

Ever since the last war there has been a growing clamor that the discoveries of science are being used to destroy civilization, that the social sciences are powerless to stop or to control the demolition and that scientists must come out of their laboratories, sometimes mis-called "ivory towers," and help to overpower the Frankenstein they have created.

The present war has greatly swelled this insistence that scientific methods shall be employed to solve the world's troubles. And when one looks at some of the very unscientific approaches, the suggestions seem to have some logic.

On the other hand it is not at once clear how the scientists will benefit by instruction from the very ones who admit failure, nor how the history of past mistakes will necessarily lead to their correction.

Better could one recommend that social scientists acquire some knowledge of physical science. But to do so will demand more than the smattering that is offered in some of the newer educational plans. People who deride a lack of knowledge of the classics or of art or music or modern literature unblushingly confess or even boast complete ignorance of atoms, molecules, electrons, mechanics and all the things that make modern civilization. If the physical scientist is to have some knowledge of the social sciences then let the social scientists in turn have at least a speaking acquaintance with the principles that underly the modern world in which we and they too live.

I hope you will not interpret my skepticism as indicating that I am opposed to a broader education for scientists or to the inclusion of humanistic-social studies. I am heartily in favor of it for all those who have the time, taste and means. I would recommend an A.B. degree for any chemist who can afford it, to be followed by specialization for the B.S. degree or its equivalent.

Furthermore, I am convinced that enough time can be found in the four-year undergraduate course in chemistry to meet the A. C. S. requirements in the Humanities. I do not believe it possible to meet the recommendations of the S. P. E. E. Committee fully in a four-year course without eliminating some of the essentials. The compromise between retention of the four-year course and the introduction of humanistic-social studies by leaving much of the departmental specialization for graduate work does not appeal to me as meeting the specific needs of the student nor of his prospective employer.

If you will indulge a reference to my own institution, the University of Minnesota, we have an Institute of Technology which includes a School of Chemistry, a College of Engineering and Architecture, and a School of Mines and Metallurgy. The curriculum for the first year is common to all of the units and includes the usual amounts of chemistry, mathematics, English and drawing throughout the year. The second year is the same for chemists and for chemical engineers and the course in physics is the same for the entire Institute of Technology. The basic subjects are mostly completed in the first two years, the last two being left more for departmentalized fields and for optional specialization within the department.

Dr. Dahlen has suggested that you would perhaps be interested in seeing how the combining of courses of common value and of specialization can be worked out in various curricula in the field of general technology. Again I have chosen my own institution and have selected for this purpose three of the most widely diversified curricula, those of Chemical Engineering, Aeronautical Engineering and Geological Engineering. It is striking that while the operations in these three fields are carried on under such varied conditions—the one in the air, one underground and the other on the surface—yet they have so much in common in basic principles.

The degree to which courses are shared by the different curricula differs from one to another. The courses common to all curricula in technology are confined mostly to the first and second years. You will notice some differentiation beginning even in the second year and specialization becoming more general in the junior and senior years. A complete comparison would involve a chart for about a dozen different fields. But the present one suffices to illustrate the principle involved.

In our School of Chemistry we have long held that a chemical engineer needs training in the four fundamental fields of chemistry so there is little differentiation in the first two years between the curriculum for chemistry and for chemical engineering in this respect. Since the chemical engineer must have in addition much training in engineering he has some but not much time left for electives. The chemist, however, is left much freer for elective choices and can and does easily include the A. C. S. requirement in humanistics.

Having seen the general principle of curriculum building through a combination of general and specialized courses, can we apply this to your undergraduate courses in textile chemistry? We must first preserve the fundamental elements of chemistry as previously set forth. We must then introduce such elements of chemical engineering and textile chemistry as needed and as far as we can go within the limitation of four years. Following our own plans‡ I have set this up by quarters, which is somewhat more elastic than by semesters, but which can be converted to semesters without too much inconvenience if necessary. While the allowances for specialized courses in textile chemistry are not all inclusive, I believe they are adequate and that details of processing can be better learned on the job. Some elective credits are also available. I have refrained from suggesting a list of electives, believing that each school can do this better by considering its own facilities and objectives. (See Table 1.)

About one-eighth of our students before the war were enrolled in a five-year combination course with our School of Business Administration. The combined curriculum was arranged to include all the requirements in chemistry or chemical engineering and enough in business administration so that at the end of five years two bachelor degrees were obtained. A similar combination with the School of Business Administration was also available to most of the departments of engineering.

The success of these five-year combination courses has suggested to us now a similar five-year combined curriculum between any field of technology and our Arts College, which would provide the desired courses in the humanistic-social "stem" and lead to two bachelor degrees.

Any student would be admitted to this combined course who had the desire and the necessary time and means to undertake it. No student would be required to take it. This has the advantage of an economical experiment on a limited scale

‡ In formulating the suggested course for chemists specializing in textile chemistry I have had the advice and assistance of Drs. R. E. Montonna and L. H. Reyerson of the School of Chemistry, University of Minnesota.

TABLE I

Suggested Curricula for Textile Chemistry Course Compared with Chemical Engineering and Chemistry Courses

SECOND YEAR

Chemical Engineering	*Chemistry*	*Textile Chemistry*
	First Quarter	
Calculus, Diff. (5 cr.)	Calculus, Diff. (5 cr.)	Calculus, Diff. (5 cr.)
Qualitative Analysis (5 cr.)	Qualitattve Analysis (5 cr.)	Quantitative Analysis (5 cr.)
General Physics (5 cr.)	General Physics (5 cr.)	General Physics (5 cr.)
Chemical German (3 cr.)	Chemical German (3 cr.)	Chemical German (3 cr.)
	Second Quarter	
Calculus, Integral (5 cr.)	Calculus, Integral (5 cr.)	Calculus, Integral (5 cr.)
Quantitative Analysis (5 cr.)	Quantitative Analysis (5 cr.)	Quantitative Analysis (5 cr.)
General Physics (5 cr.)	General Physics (5 cr.)	General Physics (5 cr.)
Chemical German (3 cr.)	Chemical German (3 cr.)	Chemical German (3 cr.)
	Third Quarter	
Tech. Mechanics (5 cr.)	Tech. Mechanics (5 cr.)	Tech. Mechanics (5 cr.)
Quantitative Analysis (5 cr.)	Quantitative Analysis (5 cr.)	Electives
General Physics (5 cr.)	General Physics (5 cr.)	General Physics (5 cr.)
Chemical German (3 cr.)	Chemical German (3 cr.)	Chemical German (3 cr.)
CHEM. ENG. MATERIALS (1 cr.)	Chem. Eng. Materials (1 cr.)	Chem. Eng. Materials (1 cr.)

THIRD YEAR

Chemical Engineering	*Chemistry*	*Textile Chemistry*
	First Quarter	
El. Org. Chem. (5 cr.)	El. Org. Chem. (5 cr.)	El. Org. Chem. (5 cr.)
Physical Chem. (3 cr.)	Physical Chem. (3 cr.)	Physical Chem. (3 cr.)
FUELS & COMBUSTION (4 cr.)	Phys. Chem. Lab. (2 cr.)	Phys. Chem. Lab. (2 cr.)
HYDRAULICS & LAB. (3 cr.)	Electives	Electives
UNIT OPERATIONS (3 cr.)		Unit Operations in Technology (4 cr.)
	Second Quarter	
El. Org. Chem. (5 cr.)	El. Org. Chem. (5 cr.)	El. Org. Chem. (5 cr.)
Physical Chem. (3 cr.)	Physical Chem. (3 cr.)	Physical Chem. (3 cr.)
Heat Engines (3 cr.)	Phys. Chem. Lab. (2 cr.)	Phys. Chem. Lab. (2 cr.)
Heat Engines Lab. (1 cr.)	Electives	Electives
UNIT OPERATIONS (6 cr.)		Unit Operations in Technology (4 cr.)
	Third Quarter	
El. Org. Chem. (5 cr.)	El. Org. Chem. (5 cr.)	LARGE MOLECULES (5 cr.)
Physical Chem. (3 cr.)	Physical Chem. (3 cr.)	Physical Chem. (3 cr.)
UNIT OPERATIONS (6 cr.)	Phys. Chem. Lab. (2 cr.)	Phys. Chem. Lab. (2 cr.)
Indus. Inorg. Chem. (4 cr.)	Indus. Inorg. Chem. (4 cr.)	UNIT TEXTILE OPERATIONS (4 cr.)
	Electives	Electives

FOURTH YEAR

Chemical Engineering	*Chemistry*	*Textile Chemistry*
	First Quarter	
INDUST. ORG. CHEM. (4 cr.)	Ind. Org. Chem. (4 cr.)	Ind. Org. Chem. (Textiles) (4 cr.)
Phys. Chem. Lab. (2 cr.)	Adv. Inorg. Chem. (3 cr.)	Colloid Chemistry (3 cr.)
Electric Power (3 cr.)	Appln. of Indcators (3 cr.)	SYNTH. OF NATURAL FIBERS (3 cr.)
CHEM. ENG. ECONOMICS (3 cr.)	Advanced Chemistry (3 cr.)	ECONOMICS (3 cr.)
Strength of Materials (3 cr.)	Chemical German (2 cr.)	Electives Power
Strength of Materials lab. (1 cr.)	Electives	
Metallography (3 cr.)		
Electives		
	Second Quarter	
Phys. Chem. Lab. (2 cr.)	Adv. Inorg. Chem. (3 cr.)	Colloid Chem. (3 cr.)
Electric Power (3 cr.)	Electrom. Meas. & Titration (3 cr.)	SYNTH. OF NATURAL FIBERS (3 cr.)
CHEM. ENG. EQUIPMENT DESIGN (3 cr.)	Adv. Chemistry (3 cr.)	CHEM. OF DYESTUFFS (2 cr.)
Metallography (3 cr.)	Chemical German (2 cr.)	MICROSCOPY (2 cr.)
Electives	Electives	TEXT. PROCESS MACH. (2 cr.)
	Third Quarter	
Phys. Chem. Lab. (2 cr.)	Adv. Inorg. Chem. (3 cr.)	COLLOID CHEM.-TEXT. (3 cr.)
Electric Power (3 cr.)	Chemical German (2 cr.)	DYEING & FINISHING (3 cr.)
CHEM. ENG. EQUIPMENT DESIGN (3 cr.)	Electives	ORG. QUAL. (4 cr.)
SPRING TRIP (2 cr.)		TEXT. PROCESS MACH. (2 cr.)
Electives		TEXT. DESIGN & TEST. (3 cr.)
		Electives

NOTE: Specialized courses appear in capital letters, common courses in small letters.

which in the course of a few years should determine the value of humanistic subjects for technologists. This is an experiment which can be tried at any institution with courses in science or applied science and an Arts College. To my mind it is a plan much preferable to forcing all students of technology into a five-year curriculum or of replacing so much of the four-year course by the introduction of humanities as to endanger its usefulness for applied technology.

In conclusion may I reiterate my conviction that the textile industry is just about to enter a golden era of pre-eminent expansion and enlarged applications in new fields. This will require men with a well-rounded training in the fundamentals of physics and all the principal branches of chemistry. You will be wise in choosing a full quota of your future technical employees from institutions which provide this type of training.

PRESIDENT APPEL: Our next speaker is another eminent scientist. He is a physical chemist, well known internationally. He, too, is a member of many scientific organizations, and he, too, has received the Nichols Medal from the New York Section of the American Chemical Society.

He has served on the faculties of the University of California, Manchester University in England, University of Louvain, and Princeton. He is now with the Graduate School at Princeton. He is a member of the Scientific Advisory Committee of the Textile Foundation. Dr. Hugh S. Taylor will speak on "Post-Graduate Training and Research for Textile Chemists."

Dr. Taylor!

DR. HUGH S. TAYLOR: I think that the textile industry really is at the cross roads, and it faces problems to which it must give serious attention. I welcome the opportunity of presenting some of the thoughts that have grown up among a group of us over a period of ten years of initial spade work to the present time, when I think that you, as well as we who are in educational circles, should turn our attention most seriously to the problem of what we are going to do, not only for the undergraduates about whom Dr. Lind has just spoken, but also for the training of those leaders in the industry, those future leaders in the industry whom you will need so urgently in the post-war era.

. . . Dr. Taylor then presented his prepared paper. . . .

HIGHER EDUCATION AND RESEARCH FOR TEXTILE CHEMISTS*

HUGH S. TAYLOR

Graduate School, Princeton University

EVEN so recently as one generation ago it could still truthfully be said that "The tailors of the Caesars knew the textiles of which we made our clothes." That was no longer true of pre-Pearl Harbor America and it will be even less true of America a few years after the peace. Not only the desire for new wearing apparels but also the needs of industry for fibers with properties which naturally occurring fibers do not possess are giving rise to basic changes in the textile industry that require and must produce a more elaborate and a broader program of education for those to whom leadership in the expanding industry will be assigned.

At the undergraduate level, as has already been indicated at this meeting, training for service in the textile industry must be in large measure a basic training in the fundamental sciences of mathematics, physics, and especially chemistry, with the supporting disciplines of English, foreign language, economics and some measure of elective courses. For training in textiles the student must acquire some knowledge of the field of high molecular weight molecules, of fiber structure and properties, and of microscopy; on the engineering side a knowledge of unit operations in the textile field, something of textile machinery and design. Experience in allied fields suggests that this is a program of which only the essentials can be covered in a normal four-year undergraduate program. The alternative program which spreads a training, stopping short of higher education and research, over a five-year period does permit the attainment of an undergraduate training of greater breadth of interest. In addition to the technical requisites, it would provide time for general elements of culture and social relationships which need to be combined in the lives of those who, from the educational advantages that they have enjoyed, should be the leaven in the communities to which they afterwards attach themselves. They could be the link between operators and management, at the center of the industrial relations which must develop, especially in this area of effort, between labor and management, and sufficiently close to each to understand both and draw both closer together.

Such an integrated five-year plan offers great advantages over a general four-year bachelor's degree program plus an additional year of "textile education." It can be so formulated that education can be interrupted at the fourth year without sacrifice of essentials. Probably only the best of the group should be urged to complete the fifth year. But this fifth year should not in any sense be regarded as a year of graduate work leading, say, to the master's degree and trifling with some type of pseudo-research. It ought to be sharply differentiated from the first year of the training in higher education and research which we shall presently be considering. Some independent work might well be required but it should take the form of the solution of a problem in the textile field based on already acquired or available knowledge, without effort, which cannot at best be very important, to provide new facts or discoveries. For this, the more intensive training at the post-graduate level is an essential preliminary.

Such a program could be put into effect not only at the existing textile schools but also in state universities and colleges as a parallel program to the various types of engineering program that now exist, and at no great additional cost. Much of the program, namely the basic topics, would be common to those of many varied disciplines far removed from textile education.

Graduate training and research is a problem apart from any such four- or five-year program already discussed. Its objectives should be the discovery and training of a research personnel which, at its best, can revolutionize the basic data of the industry, enlarge the horizons and open up pathways to new knowledge. It should provide the technical leaders of the future in the industry. Two conditions are essential for such a program: opportunity for intensive educational training, at a high level of academic excellence, in the several disciplines basic to the field; opportunity to conduct research in a center where the fundamental science pertaining to textiles is the major objective of research. Universities, colleges and many of the textile schools do not normally provide both of these conditions and so the problem of graduate training and research in the textile field actually calls for a special solution. One solution appears to lie in a central institute for research in textiles affiliated with an educational institution, with full collaboration between the two. The educational institution would be responsible for the education in the basic disciplines of the subject at the graduate level. The institute for textile research would provide the specialized training pertaining to the textile field and also determine, supervise and provide the facilities for the research work performed in fulfillment of thesis requirements for higher degrees. These degrees would be granted by the educational institution upon the basis of examinations like those for its own normal higher degrees but with the modifications as to training content and type of research performed to meet thesis requirements that the objectives of the textile program might require.

The research institute, which Dr. C. E. K. Mees of the Eastman Kodak Company has classified as "convergent" in distinction from the more usual "divergent" laboratories of universities, concentrates upon a group of connected problems. It has grown out of the specialization of investigators, frequently in university centers, in some single field of work important enough to attract students to the field and resulting finally in the establishment of the laboratory in

* Presented at the Annual Meeting, Atlantic City, N. J., October 13, 1944.

question as the center of research in the subject. The Cavendish Laboratory in Cambridge, England, the Leiden Laboratories under Kammerlingh Onnes for low temperature research, the Kaiser Wilhelm Institute for Physical Chemistry under Haber in Berlin, the Mount Wilson Observatory in Pasadena and the Radiation Laboratories of the University of California under Lawrence are famous examples of such research institutes. The laboratories of the Eastman Kodak Company at Rochester, of the General Electric Company at Schenectady, of the Bell Telephone Laboratories at New York and Summit, N. J., of R.C.A. at Princeton and of Westinghouse at Pittsburgh are research institutes of the "convergent" type provided by industries to aid their own technical development and progress. The regional laboratories of the U. S. Department of Agriculture are government-sponsored efforts of the research institute type.

The research institute appears to be the solution of the problem of fundamental research for decentralized industries that operate in small, widely distributed units with only a relatively small number capable of maintaining research laboratories for the solution of their industrial problems and few of these able to blaze a trail of fundamental science into the unknown. The textile industry, especially in so far as it is concerned with natural fibers as opposed to the newly developing synthetic fibers, is precisely one of the most highly decentralized of industries. For it, a co-operative effort shared in limited amount by each unit, but in total amount large and impressive, would appear to be the method by which a "convergent" research institute could be established. Its main objectives should be (1) the prosecution of research in the general field of the subject, its physics, chemistry, biological and engineering aspects, (2) the discovery and dissemination of research information covering scientific and economic aspects of the industry and (3) the training in the methods of research of specially selected personnel at the graduate-student level. Such a research institute, located favorably with respect to and co-ordinated with an existing educational foundation offers, it would seem, the best possibility for securing both higher education and research in textile science. It represents a solution that can be achieved with the minimum of expense and duplication of educational effort. It would multiply the research effort which the institute could achieve within a moderate budget. It would enlarge the research horizons of the personnel of both institute and educational foundation. Co-operative research institutes of this type in the educational centers of the land can be of significant importance in the general problem of support for research which the nation has to face in the post-war period.

To make such a proposal concrete and to indicate how it might solve the problem with which we are here concerned, namely higher education and research for textile chemists, we shall set forth how such a program might be adapted to Princeton University as the educational institution together with the research institute that can be achieved by the transfer to Princeton of the program hitherto sponsored by the Textile Foundation at the U. S. Bureau of Standards in Washington. This transfer is becoming practicable by reason of the fact that the Textile Research Institute, Inc., of New York has recently acquired a property in Princeton where such a research effort could be adequately housed and maintained.

Princeton University grants the higher degrees of M.A. and Ph.D. without distinction of subject. In the commencement program and in its diplomas the field in which a student concentrates is indicated. The tradition of its Graduate School has always been an intensive training, at a high level of academic excellence, of a relatively small number of graduate students chosen from a large body of applicants to fill a strictly limited quota in each subject. In the best departments, it is not unusual for the quota to be only 10 or 20 per cent of the applicants and, hence a considerable measure of selection of students is possible. The graduate student body thus becomes a small compact unit at a relatively high level of scholarship without the dilution by students of poor quality that often arises in the absence of a strictly limited quota system. The Textile Research Institute, established at Princeton, could plan to operate a student fellowship program on the same quota basis and expect to attract to its own educational program the same high quality of applicants.

The M.A. degree in Princeton is awarded on the sustaining of the General Examination for the Ph.D. degree, which examination ordinarily comes towards the close of the second year of graduate work. The present procedure in the Department of Chemistry is indicative of how the M.A. could be awarded to students of the Textile Institute. The Department of Chemistry conducts a general examination in three of the four branches of chemistry, inorganic, analytical, organic and physical, and a special examination in the fourth field, which is that in which the student is specializing or intends to specialize. Such special examinations are written for the individual students and give them opportunity to reveal specialized training in a chosen field. With Institute students this would undoubtedly pertain to textile chemistry but this might be in the organic, physical, or other division of the field depending on the individual orientation of the student. It would be based in part on the training provided in the Textile Institute in the special field. For the Ph.D. degree the additional requirements are a thesis, which for textile students would be research of a basic character in the textile fields carried out in the Institute, and a final oral examination which reveals the breadth of a student's training in his chosen field and the comprehensive aspects of the subject. In the conduct of the General Examination leading to the M.A. degree, representatives of the Textile Institute could assist the examiners in that part of the examination in which the candidate displays his special interest. His performance in the general fields of the subject would be judged, as in the case of ordinary University graduate students, by the University examiners charged with this responsibility within the University. The examination results would be reported to the appropriate University department for action and recommendation to the University Graduate School Committee.

The estimate of the thesis submitted in the University is normally assigned to two examiners, one of which is the man under whose direction the work is performed, the other an interested professor. Theses submitted dealing with investigation in the Textile Institute could thus normally be estimated by one member of the Textile Institute and one member of the University Faculty in the department concerned. Their report would be transmitted through the departmental Committee on Graduate Work to the Department for action and report to the University through its Graduate School Committee.

The final oral examination is public and held in the presence of, normally, at least four examiners including the two responsible for the estimate of the thesis. Four examiners, two from the Institute and two from the department concerned might well form such an examining body for Institute students. Other members of the departmental faculty and Institute personnel should be encouraged to attend such oral examinations. The examiners' report, if unanimous, would be transmitted directly to the Graduate School of the University for final disposition. In case of disagreement the matter would be referred to the department concerned for decision and report. The examiners in-

volved would necessarily be called into consultation in such cases.

So much for the mechanics of a liaison which could be paralleled in any other department of the University, physics, biology, engineering, economics, industrial relations, dependent upon the research objectives represented within the research institute. Even a limited program, involving not more than ten students per year, would furnish to the textile industry a body of competently trained personnel that the industry has never enjoyed hitherto. If each research center for textiles throughout the country were thus affiliated with a center for higher education a considerable increase in yield from such a program would result. Such groups continuously introduced into the ranks of textile industry should make a conspicuous change in the attitude of the industry towards research and development. Especially at the present time, when industries which date back beyond the Caesars are being called upon to adjust their processes and techniques to the conditions which new synthetic fibers are creating, the necessity for influx of such a trained personnel is steadily becoming more acute.

The program just outlined stresses the basic science of textiles in contradistinction to textile technology. It does not call necessarily for an amalgamation of the two in a single joint effort. Technology is a separate activity of mankind directed to the production of more and better things. The motives of the scientist are the association of observations and their classification. The training in basic science does not have, in contrast with that in technology, the utilitarian motive. It can still be sound training in basic science though it never lead directly to more and better things. Indirectly, however it can always finally bring rewards to mankind. It should be judged by long-range standards. Industry and technology do receive benefits from fundamental research in at least two directions. The supply of properly trained research men inevitably increases in centers of intense research activity. The new discovery is as luring as gold. Secondly, the broadening of understanding that accompanies each new extension of basic science means for industry and technology a surer, swifter and often a more economical approach to the solution of its own problems. The auto-accelerating effects of pure science in the history of mankind since the time of Newton is evident to everyone; the pace of technology in the 20th century as compared even with that in the preceding century is a patent illustration of this change in rate of development.

There would appear therefore to be no need to complicate the program in education and research for textile chemists by attempting a two-fold objective, in technology and science; nor, in my judgment, need the pattern of training for research by textile chemists be fundamentally different from that in many other fields, unless it be that the training needs to be more thorough and at a higher level of scientific knowledge. It is not simply by accident that it is only within these last two decades that fundamental science has penetrated into the area of textile technology. Rather must we conclude that, before about twenty years ago, science was little prepared to enter that field competently. Cotton, linen, silk and wool are from the chemist's point of view very complex chemicals. They take their place alongside the sugars, starches and proteins as among those natural products which, only at the beginning of the present century, chemists had the courage and the necessary preliminary knowledge to dare to examine. While progress has been magnificently encouraging we know today that we have only penetrated the frontiers of the domain and we know also that the attainment of full mastery in the area calls for the highest qualifications of those engaged. That is one reason why I insist that only students of high academic excellence shall be selected for the further education and research involved.

The type of work involved calls for personnel with breadth of interest and competence in more than one aspect of chemical science. The field of large organic molecules, linear in the case of fibers, means that the student has to be familiar with the structural and synthetic aspects of chemistry largely stemming from the domain of the organic chemist; in addition, however, he must needs be *au fait* with all the various techniques that the physical chemist and physicist have brought to the elucidation of complex structures and their properties. It is a field, also, in which purely theoretical science can make vital contributions. Let us illustrate this point from a recent experience in the field of rubber science, allied to textiles in that, here also, we deal with linear molecules, coiled and cross-linked to give elasticity, exactly, we now know, as in the case of wool fibers.

A theoretical chemist recently invited to examine theoretically the properties of rubber molecules reached the conclusion that he could proceed more readily with his analysis if the experimental scientist had made experiments on the properties of rubber different from the usual measurements of elastic properties. He would prefer, he stated, that, in place of measurement of extension of rubber at constant load, the experimentalist should make measurements of strain at constant extension. The rubber research laboratory promptly provided him with such a set of measurements; he deduced, from these data, fundamental conclusions concerning the mechanism of stress relaxation, and as a consequence, the rubber industry now possesses a valuable new tool for defining its product.

Our ideal student in the textile field must be therefore, something of an organic chemist, something of a physical chemist and physicist, nor will a knowledge of higher mathematics be anything but advantageous. Whether he deals with structure, physical properties, those chemical properties basic to dyeing, finishing, or subsequent use, he must needs be possessed of rare scientific gifts and qualities if he is to go to the top in his profession. For such only the best of training will suffice. The provision for such training is a challenge to the whole textile industry, the research personnel which this audience so largely represents, the management who must look increasingly towards basic science if their own particular industry is to survive the competition that the post-war world will surely bring.

PRESIDENT APPEL: Our next speaker has had long experience in surveying the professions.

He was born at Inverness, Scotland, and received the B.Sc. Degrees in Mechanical, Civil and Electrical Engineering from St. Andrews University. Since coming to this country in 1929, he has taken his Master of Arts Degree at the George Washington University in Washington, D. C., where he is now a candidate for the Ph.D Degree in Econometrics. He became an American citizen in 1935. He served in the last World War with the Royal Naval Air Service and Royal Air Force.

His first professional engineering assignment was with the Societa Anonima Jutificio Vercellese in Vercelli, Italy. He later returned to Scotland as Industrial Engineer with Shell-Mex Ltd., after which he was Assistant Chief Inspector of Diesel Engines with Harland and Wolff Ltd., both of Glasgow. His first employment in this country was with the Eastman Kodak Co., at Rochester, N. Y.

Before joining the staff of the U. S. Bureau of Labor Statistics in Washington, D. C., in 1935, he was assistant to the Secretary of the American Engineering Council, where his duties involved participation in the formulation of policies affecting professional engineers. He has taught engineering subjects at Dundee Technical College in Dundee, Scotland, and more recently has been teaching statistics at the George Washington University, Washington, D. C.

He is a member of the American Association for the Advancement of Science, the Institute of Mathematical Statistics, and the Econometric Society.

He is at present employed as Principal Administrative Officer in the Control Division of the Office of the Chief Signal Officer. Immediately prior to this, he served as Economist and Statistician at Headquarters, U. S. Army Air Forces. I will ask Mr. Andrew Fraser, Jr. to speak now on "The Professional and Economic Status of the Textile Chemist." Mr. Fraser! . . . Mr. Fraser then presented his prepared paper. . . .

THE PROFESSIONAL AND ECONOMIC STATUS OF THE TEXTILE CHEMIST*

ANDREW FRASER, JR.

Control Division, Office of the Chief Signal Officer, War Department

MY appearance here today as your honored guest happens to coincide with the anniversary of the day on which I was introduced to the manufacture of textiles. On October 13, 1913, when slightly over 15 years of age, I began to serve my five years apprenticeship in engineering in one of the principal jute mills in Dundee, Scotland. Those were "Ye goode olde dayes!" Regular hours of employment were 6 A.M. to 6 P.M. Monday through Friday with only a half day on Saturday. Invariably, "shanks mare" was the only means of locomotion to and from the mill. As a first year apprentice my base pay was 60 cents a week. Two evenings a week we had to work overtime until 10 P.M. for which we were paid time and a half. My mother permitted me to keep the overtime pay as pocket money.

When in 1925, immediately following graduation from St. Andrews University, I completed the erection of the jute mill for the Societa Anonima Jutificio Vercellese, Vercelli, Italy, I thought, because of other plans, that I had severed all connection with the textile industry. The fates willed otherwise. In 1934, in Washington, D. C., I was assigned the task of doing the research for the Textile Foundation's publication "The Training of Men for the Textile Industry"[1] and for a short time beginning in 1935, my experience with the Bureau of Labor Statistics was with surveys of wages, hours and working conditions in some of the textile mill-products industries.

While with the Bureau I was assigned the task of the Survey of the Engineering Profession.[2] This report served subsequently as the model for the 1941[3] and 1944[4] Surveys of the Economic Status of the Members of the American Chemical Society.

Against this background it is apparent that our affinity with respect to today's assignment is a little more than partial. Complete affinity is of course precluded because I am not a trained textile chemist. I feel confident that what I have to say today on the professional status of the textile chemist will bring us closer in the scale of affinities.

Because the remarks which follow will center around the term "status" it is in accord with the scientific method to define the term. For purposes of discussion therefore status is defined as the position or standing of an individual in a profession. The individual is of course a textile chemist; the profession is that of chemistry. And since the term "position" immediately connotes employment the first question to be asked is, What are the fields of employment opportunities for textile chemists?

Examination shows that these opportunities exist chiefly in two distinct fields. On the one hand a textile chemist may become attached directly to a textile mill-products industry. On the other hand he may find employment with a chemical manuafcturing concern, a private research institution, or a commercial laboratory which has a primary interest in matters that pertain to textile chemistry or textile manufactures and their products.

When the next question is asked: How many employment opportunities exist in these two fields for textile chemists? recourse must be had to two different sources of information. In the case of the textile mill-products industries the range in employment opportunities is readily obtainable from the figures reported under manufacturing industries in the 1940 Census of Population. These data it may be noted in passing clearly indicate the importance of textile mill-products in the national economy. In 1940, total employment in all manufacturing industries was 10,600,300. Of this number of workers 1,168,780 or 11 per cent were engaged in the manufacture of textile mill-products; but also in 1940 these same textile industries gave employment to as many as 1,200 professional chemists (Table 1).

Among the eight textile industry classifications the largest number of employment opportunities for professional chemists, 280 or 23.4 per cent was reported for woolen and worsted manufactures. Next in order comes the dyeing and finishing of textiles with 260 chemists, followed by 220 in textile goods not specified and 120 chemists in the employ of establishments engaged in silk and rayon manufactures. These four industries when considered as a whole account for 900 or 75 per cent of the 1,200 chemists. The remaining 300 or 25 per cent include 120 chemists in miscellaneous textile goods, and 60 chemists in each of the three industries designated cotton manufactures, knit goods, and carpets, rugs, and other floor coverings.

To evaluate employment opportunities for textile chemists in the non-textile mill-products fields the best data available at this time are those contained in the reports of the 1941 and 1944 Surveys of the Economic Status of the Members of the American Chemical Society. Because these surveys contain analyses of responses for 11 of the years in the seventeen-year period 1926 to 1943 they permit of tracing the historical trends of employment opportunities. Unfortunately similar analyses are impossible with respect to the Census data.

In each of the ACS surveys identical information was requested from the members regarding their field of specialization. Of the 34 such fields listed in the questionnaire the three most closely allied to textile manufactures and textile chemistry have been selected. These fields are textiles and their manufactures, synthetic fiber technology, and synthetic resins (Table 2).

Despite the Great Depression and a transition from a peace to a wartime economy these figures certainly demonstrate that the demand for textile chemists in the period 1926 to 1943 was far from being on the decline. Among the three fields of specialization there were, however, marked variations in the demand. Relatively, the greatest demand occurred in synthetic resins. In 1926 this field was reported by 77 members and by as many as 1,091 members in 1943. In other words, over the 17-year period the

* Presented at the Annual Meeting, Atlantic City, N. J., October 13, 1944.

[1] By Frederick M. Feiker, Washington, D. C., 1934.

[2] See U. S. Bureau of Labor Statistics Bulletin No. 682 "Employment and Earnings in the Engineering Profession, 1929 to 1934." Prepared by Andrew Fraser, Jr., under the direction of A. F. Hinrichs.

[3] See "The Economic Status of the Members of the American Chemical Society, 1926 to 1941" by Andrew Fraser, Jr. Reprinted from Chemical and Engineering News, Vol. 20, Nos. 20. 22, 23, 24. 1942. The Mack Printing Co., Easton, Pa.

[4] See "Professional Chemical Workers in War and Peace. An Analysis of the Economic Status of the Members of the American Chemical Society, 1941 to 1943." By Andrew Fraser, Jr. Reprinted from Chemical and Engineering News, Vol. 22, Nos. 10, 13, 16, 19. 1944. The Mack Printing Co., Easton, Pa.

Table 1. Distribution in 1940 of professional chemists employed in textile mill-products industries.

Textile mill-products industry	All workers	Professional chemists*	
		Number	Percentage
All industries	1,168,780	1,200	100.0
Woolen & worsted mfrs.	146,080	280	23.4
Dyeing & finishing textiles	50,520	260	21.7
Textile goods not specified	59,480	220	18.3
Silk & rayon mfrs.	108,760	140	11.6
Miscellaneous textile goods	35,640	120	10.0
Cotton mfrs.	482,440	60	5.0
Knit goods	218,900	60	5.0
Carpets, rugs & other floor coverings	48,360	60	5.0
Hats exclusive of cloth & millinery	18,600	..	..

Source: 16th Census of the U. S., Population, The Labor Force.

* Although the Census occupational classification reads "Chemists, assayers, and metallurgists" it is reasonable to assume that the numbers so classified in the textile mill-products industries are primarily chemists.

Table 2. Distribution in period 1926 to 1943 of ACS members in selected fields of specialization.
(Without regard to any attribute)

Year	Field of specialization					
	Textiles	Synthetic fiber technol.	Synthetic resins	Textiles	Synthetic fiber technol.	Synthetic resins
	Number			Ratio with respect to 1926 responses		
1926	124	55	77	..	..	..
1929	148	96	140	1.2	1.7	1.8
1932	183	104	198	1.5	1.9	2.6
1934	205	130	267	1.7	2.4	3.5
1937	245	172	431	2.0	3.1	5.6
1938	257	179	459	2.1	3.3	6.0
1939	269	207	541	2.2	3.8	7.1
1940	291	225	652	2.3	4.1	8.5
1941	292	242	706	2.3	4.4	9.2
1941	260	228	746	2.1	4.2	9.7
1943	267	255	1,061	2.2	4.6	13.8

Source: 1941 and 1944 Surveys of the Economic Status of the Members of the American Chemical Society.

Table 3. Distribution in 1941 of ACS members in selected fields of specialization, by years of professional experience.

Years of professional experience	Field of specialization					
	Textiles	Synthetic fiber technol.	Synthetic resins	Textiles	Synthetic fiber technol.	Synthetic resins
	Number			Percentage		
Total	292	242	706	100.0	100.0	100.0
0 and under 3	15	10	59	5.2	4.2	8.4
3 and under 5	25	15	78	8.6	6.2	11.1
5 and under 7	28	29	94	9.6	12.0	13.3
7 and under 10	26	42	133	8.9	17.4	18.8
10 and under 14	54	43	144	18.3	17.8	20.5
14 and under 18	39	48	85	13.4	19.7	12.0
18 and under 22	30	28	48	10.3	11.6	6.8
22 and under 27	37	14	39	12.7	5.8	5.5
27 and under 32	18	10	17	6.2	4.1	2.4
32 and under 37	10	2	6	3.4	0.8	0.8
37 and under 42	1	..	2	0.3	..	0.3
Over 42	2	..	..	0.9	..	..
Not reported	7	1	1	2.4	0.4	0.1
Median years of professional experience	13.6	12.3	9.7	..	..	..
Median age	36.6	35.3	32.7	..	..	..

Source: 1941 Survey of the Economic Status of the Members of the American Chemical Society.

demand for such services increased approximately fourteen fold. In the case of synthetic fiber technology the increased demand by 1943 was approximately five times that which existed in 1926, whereas, the corresponding figure for textile manufactures and their products was only slightly over two-fold. Actually, in 1926, synthetic fiber technology was reported by 55 members and by 1943 the number had increased to 255 members. The corresponding figures for textile manufactures and their products were 124 and 267 members.

Clearly despite such limitations as may attach to the source data the preceding discussion certainly demonstrates that employment opportunities for textile chemists are substantial in number and broad in extent. But how about their relative standing in these positions with respect to their years of professional experience or earnings capacity?

For example, with regard to years of professional experience: Can the young graduate pass directly into the field of textile chemistry? Or must he wander to and fro for several years in other fields of chemistry before he gains entrance to his chosen field of endeavor? In short, is age a limiting factor? The answer apparently is "No." For if we consider the distribution of the 1941 responses of ACS members, by years of professional experience, to the same fields of specialization used to evaluate employment opportunities we establish the following facts (Table 3).

Among these three fields the proportions of members who had less than 3 years professional experience in 1941 range from 4.2 per cent for synthetic fiber technology to as high as 8.4 per cent for synthetic resins. Thereafter the proportions in each of the three fields steadily increase to a maximum value and then decline. The first observation clearly indicates that the demand for new graduates in textile chemistry is substantial. The import of the second observation is that the demand for similar services exists at every experience level.

Of further significance is the fact that in the field of textile manufactures 50 per cent of the respondents had more than and 50 per cent had less than 13.6 years of professional experience. Translated to an age basis this median experience level corresponds to a median age of 36.6 years because in this country the median age of graduation from colleges and universities is 23 years. In the other two fields of specialization it is of interest to note the median years of professional experience, and, of course, of age are lower. In textile fiber technology the difference is of the order of 1.3 years, whereas, as between textile manufactures and synthetic resins the difference is as great as 3.9 years. The fact that these age differences did exist in 1941 shows that, relatively, the employment opportunities for younger textile chemists were greater in synthetic resins than in either synthetic fiber technology or textile manufactures and their products.

These differences in age composition of textile chemists are related directly to earnings capacity, because, as professional workers, age or years of professional experience is a function of this important aspect of economic status. Let us, however, look first at the nonage pattern of the salary structure of textile chemists as it existed in the period 1929 to 1941. The source of these data is the 1941 ACS Survey (Table 4).

Subject to the qualifying remarks contained in Table 4, it is interesting to note that in no one of the three years 1929, 1934 or 1941 were monthly salary rates of members in any of the textile chemistry fields lower than the median monthly salary rates of all members in the sample. For example, in 1941, while median earn-

431596

Table 4. Comparison of median monthly salary rates in 1929, 1934, and 1941 of ACS members in selected fields of specialization.

Year	1929	1934	1941
Field of specialization		Median monthly salary rate	
All members	$249	$216	$271
Textiles	308	241	307
Synthetic fiber technol.	252	248	322
Synthetic resins	290	231	288

Source: 1941 Survey of the Economic Status of the Members of the American Chemical Society.

Remarks: Because the rates shown for all members refer to male and female regular and junior members, and the rates for the separate fields of specialization refer only to male regular members, comparisons among these two sets of data are subject to some qualification. This qualification is, however, believed to be slight because the sample contained relatively few females or male junior members.

ings of all members reporting were $271 a month, among the three fields of textile chemistry median earnings ranged from $288 a month for members engaged in synthetic resins to as high as $322 a month for those employed in the field of synthetic fiber technology. The intermediate position in this median earnings range, namely, $307 a month was reported by chemists engaged in textile manufactures. Clearly, the earnings capacity of textile chemists ranks high when contrasted with that of other chemists.

This general statement requires further elucidation, because, as indicated above, earnings of professional workers increase with advancing years of professional experience. Unfortunately comparisons of growths in earnings with age among the three fields of textile chemistry are not possible. Such data are, however, available for one of these fields, namely, synthetic resins, analysis of which may help to throw light on the salary structure of the other two fields.

In 1941 the median monthly salary rates of chemists in the field of synthetic resins steadily advanced from $183 a month for those with 3 years of professional experience to as high as $430 a month for those with from 27 to 31 years of professional experience. In other words, over a 26-year span the median earnings of older members were approximately two and one-half times greater than those reported by younger members.

Of further interest is the fact that at virtually all experience levels, comparisons show that median earnings of chemists in synthetic resins exceeded those reported by chemists in at least four other fields. These fields are organic chemical technology, petroleum and its products, rubber and its products, and paints and varnishes.

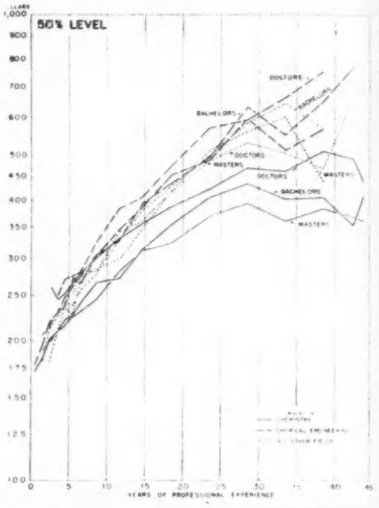
This situation bears a relationship to the facts established earlier, namely, that in 1941 the age composition and median earnings of chemists in synthetic resins were lower than those reported by chemists engaged in either textile manufactures or synthetic fiber technology. Acceptance of these facts leads to the assumption that the salary structure of chemists on an age basis in the two last named fields should compare just as favorably with, if not be better than, that of their brother chemists in the field of synthetic resins.

Having established the general pattern of certain fundamental aspects of the professional status of the textile chemist as they existed in 1941 it is pertinent now to inquire if similar relationships exist today. If the 1944 ACS Survey may be taken as a guide it would appear that the general economic status of textile chemists certainly did not deteriorate. In the period 1941 to 1943, for example, unemployment among ACS members was virtually non-existent. Monthly salary rates increased markedly at all five earnings levels and at all experience levels. And the younger chemists will note particularly that the greatest incidence of the earnings increases fell upon the younger members of the Society.

The particular extent to which textile chemists participated in this period of increased earnings is indeterminable, because, no analyses of earnings in relation to field of specialization were made in the 1944 ACS Survey. But since the economic status of textile chemists is dependent to a high degree on what happens to other chemists certain of the special analyses of earnings which were made in the 1944 Survey can be used to illustrate the following: (1) The general status of earnings of chemists in 1943; (2) How earnings of chemists are affected by education, the basic aspects of which were admirably discussed earlier by Dr. Lind and Dr. Taylor. These analyses will serve also to establish the general relationship of chemists' earnings to those of chemical engineers and professional workers in "All other fields" (Chart 1).

Considering first the median earnings curves of chemists it will be noted that doctors in this field have a distinct monetary advantage at all experience levels over both masters and bachelors. On the other hand the respective earnings curves of masters and bacheelors in chemistry show little variation up to the 15 years experience span. Beyond this experience span, howeever, the advantage in earnings capacity appareently accrues to bachelors. In 1943 the median monthly salary curve for doctors in chemistry rose from $262 a month for those with 2.5 years professional experience to as high as $511 a month for those with 38.5 years professional experience. Over the same 36-year experience span median earnings of masters advanced from $199 a month to $385 a month and those of bachelors advanced from $202 a month to $407 a month.

CHART 1
Median Monthly Salary Rates of All ACS Members in 1943.
By years of professional experience and educational level.



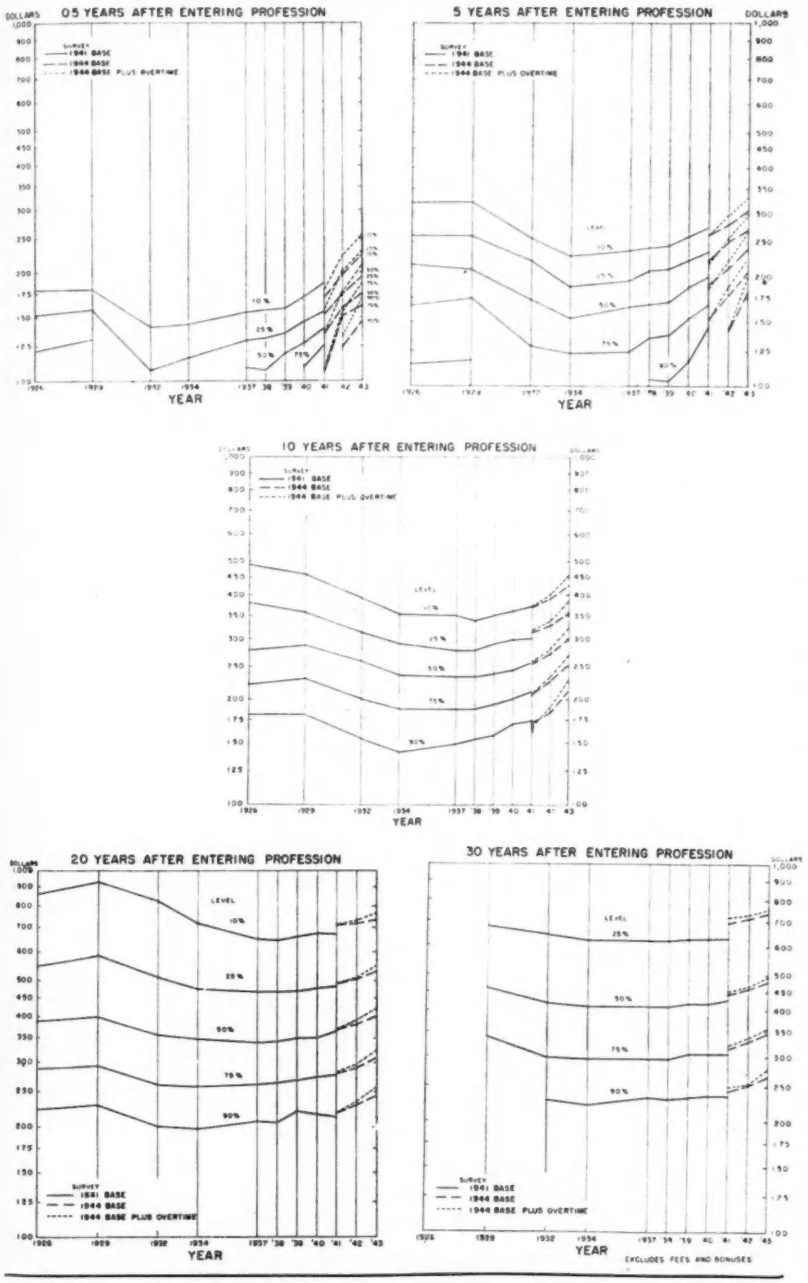
When these 1943 earnings of chemists are contrasted with those reported by members in the general fields of employment of chemical engineering and "All other fields" it will be noted that the earnings curves of bachelors and masters in chemistry lie well below the other curves at virtually all experience levels. And while doctors in chemistry up to the 15 years experience level reported earnings that lie midway between the extremes of earnings of members in the other two fields of employment thereafter their earnings curve lies below.

As an indication of trends of earnings in 1943 the comments regarding the curves in Chart 1 have value only in the general sense. It has, for example, to be recognized that, despite the segregation into doctors, masters, and bachelors, the earnings shown for chemists at any educational or experience level are a composite of a number of factors. They refer in fact to earnings reported for numerous sources of employment, as well as a wide range of fields of specialization and occupational statuses. Furthermore, they illustrate but one of five earnings levels, the median, which, if it may be reiterated means that at any experience level 50 per cent of the group were earning more and 50 per cent were earning less than a stated amount per month. This spread in earnings is insufficiently recognized by professional workers.

That this spread does exist is unequivocably demonstrated by the curves in Chart

CHART 2

Monthly Salary Rates of All A.C.S. Members Reporting for Corresponding Years After Entering the Profession. Period 1926 to 1943.



2 which shows the monthly salary rates of 5 groups of ACS members who had similar years of professional experience in 11 of the years in the period 1926 to 1943.

The significant feature of these curves is the uniformity in spread which existed from year to year in the period 1926 to 1943. And since they also reflect the changes in earnings capacity of professional chemical workers over a period in which there were cataclysmic changes in the industrial activity of the country the following assumptions appear to be in order: First, that insofar as spread in earnings among professional chemical workers is concerned it is highly improbable that the future will witness any marked change in these regards. Second, it would be foolhardy for any one to predict what individual textile chemists will earn in the future.

The textile chemist has to recognize that his employment, like that of most chemists, is dependent to a high degree on the level of activity which prevails among the country's manufacturing industries. It can only be hoped that, in the future, employment opportunities with opportunities for advancement will be available to him. On the other hand, it is also to be hoped that the textile chemist on his part will continue to demonstrate his ability to cope with changing conditions in matters allied to textile chemistry. As a professional worker this technical responsibility is accepted without question. In equal measure he has to recognize that he too has a service to perform in endeavoring to improve the non-technical aspects of his professional and economic status.

— ♦ ♦ —

FALL MEETING, MIDWEST SECTION

THE Fall Meeting of the Mid-West Section was held at the Bismarck Hotel, Chicago, Illinois, on November 4, 1944. The afternoon meeting was called to order at 2:00 P.M. Eighty-nine members and guests attended.

Information Forum

"Panel of Experts:" N. G. Koebler, Herman Boxser, W. E. Brainerd and A. G. Roy.

The following questions were presented:

1. What type of gums or starches are used in printing Vat Dyes on cotton or rayon fabric and how are the color percentages controlled by this method?

Answered by A. G. Roy—There are several suppliers who make a suitable vat printing gum. These gums are combinations or mixtures of Tragacanth and cornstarch, or British gum, although a great many printers prefer making up their own vat gums. The combined starches used frequently by the printers are made up as follows:—5 lbs. corn starch, 25 lbs. converted starch, 25 lbs. solubilized starch, 50 lbs. soda ash, 40 gals. water. This is cooked for about one half hour at 195 to 200° F., cooled to 130° F., then add: 50 lbs. hydrosulfite N.F., 10 lbs. glycerine. This makes up a 50 gal. bulk from which the printer may take any required amount to make up his formula. These formulae are usually based on 100 per cent. In other words, if a printer uses 1 per cent of color, he must use 99 per cent paste or gum, or 10 per cent color and 90 per cent gum already prepared as above.

2. We have some trouble in dyeing a good level sulfur black on unboiled cot-

ton yarn in a skein dyeing machine, capacity 500 lbs.; metal is cast iron. Our trouble is uneven dyeing and bronzing. We also find small white spots on some lots which have resisted the dye entirely. We are asking if you could advise us just what to do to overcome our difficulty.

Answered by N. G. Koehler — Mr. Koehler gave four possible causes for the above. Hard water, improper dissolving of dyestuffs, incorrect balance between sodium sulfide, soda ash and dyestuffs, and insufficient rinsing. He said there should be six to eight rinses with slight oxidation and that all oxidation before rinsing should be prevented.

3. What causes tendering of cotton when dyeing vat yellow and orange?

Answered by A. G. Roy—These colors when exposed to too much light when oxidizing causes tendering. The oxidation of the dyestuff in the presence of light forms a peroxide and this with the oxidized color causes tendering of the cellulose. This can be eliminated to a certain extent by using tannic acid in the dye bath. The acid is oxidized instead of the cellulose and naturally less tendering occurs.

4. A question was asked from the floor on whether the Melamine resins will apply to wool for shrinkproofing purposes, and if they are combined chemically or physically. Herman Boxser of Western Felt Works said it acted physically rather than chemically. He also said that this field is relatively undeveloped.

5. A question was asked about the dyeing of acetate and cotton hosiery. This question was answered by W. E. Brainerd of Rollins Hosiery Mills.

After the information forum, John O'Day of the Nyanza Color & Chemical Co. was introduced by Mr. Hartquist. Mr. O'Day gave an interesting talk on "The Level Dyeing of Damaged Wool," in raw stock dyeing. This talk was illustrated with a series of dyeings on 56/s South American Pulled Wool and 60/s Australian mildewed and sunlight damaged wools. These dyeings showed that by careful selection of colors and proper application, these damaged wools could be dyed level.

The afternoon meeting adjourned at 4 P.M.

Dinner was served at 7:30 P.M. and ninety-seven members and guests were present. The minutes of the previous meeting and the Treasurer's report were accepted as read. The following committees were appointed—Nominating Committee—L. C. Voss, Jack Moertel, W. E. Brainerd, Fred Davis and Harold Bragg; Rumpus Committee composed of fifteen members with A. G. Roy, chairman.

Mr. Hartquist then spoke on the Mid-West Section sponsoring the National Convention in 1945.

A. T. Brainerd made a motion to extend an invitation to the National Council that our section sponsor the Annual Meeting in Chicago in 1945. This was seconded by Herbert Tetzlaff. Fifty-four ballots cast—51 yes, 3 no.

Elmer Smith was appointed General Chairman for the Convention with the hope the National Council considers Chicago favorably.

W. L. Friend, of the International Nickel Co. gave an interesting talk on Corrosion Resisting Materials in Dye House Equipment. This talk was illustrated with slides.

The meeting adjourned at 10:45 P.M.

Respectfully submitted,
Louis Hoehn, Jr., *Secretary*.

—♦ ♦—

MEETING, SOUTHEASTERN SECTION

THE Southeastern Section held its November meeting at the Atlanta Athletic Club on Saturday, November 25, 1944, beginning with buffet supper served at 7:00 P.M.

Chairman O. G. Edwards called the meeting to order and Earl Mauldin led the singing of "America."

A. K. Haynes reported a total of sixteen (16) Corporate Members for our section.

M. T. Barnhill reported on our Intersectional Contest Paper and asked for suggestions from members for ideas on a good paper for our section to present next year.

Chairman Edwards then turned the program over to our program chairman, L. E. Whittelsey, who introduced our guest speaker, Dr. Donald H. Powers, of Monsanto Chemical Company. The subject of Dr. Powers' address was, "What We May Expect from Resins for Textile Application." This excellent address gave much food for thought and prompted many questions from members and guests which were answered by Dr. Powers.

The following officers were elected for 1945:

O. G. Edwards, Chairman
Avondale, Mills
Sylacauga, Ala.

J. E. Smenner, Vice Chairman
Callaway Mills
LaGrange, Ga.

W. B. Griffin, Secretary
Kali Mfg. Company
Atlanta, Ga.

L. E. Whittelsey, Treasurer
Southern Dyestuff Corp.
Macon, Ga.

Robert W. Philip, Councilor
Callaway Institute, Inc.
LaGrange, Ga.

NOTICE RE: DUES

Dues received to date have been acknowledged with membership cards.

●

If you have not received yours, please notify the Secretary:

Dr. H. C. Chapin
Box 28
Lowell, Mass.

Sectional Committee:

James F. Armstrong, Spalding Knitting Mills, Griffin, Ga.; M. T. Barnhill, Avondale Mills, Sylacauga, Ala.; James C. Farrow, Russell Mfg. Company, Alexander City, Ala.; William R. Jones, Dundee Mills, Inc., Griffin, Ga.; A. K. Haynes, Rohm & Haas Co., Atlanta, Ga.; R. O. Simmons, Pepperell Mfg. Company, Lindale, Ga.; J. W. Swiney, Fulton Bag & Cotton Mills, Atlanta, Ga.; and J. M. Youngblood, Callaway Mills, LaGrange, Ga.

Our attendance prizes were won by Robert J. Lovvorn of Georgia Twine and Cordage Company and G. B. Hale of Seydel-Wooley & Company.

Attendance: seventy-one (71) members and guests.

Respectfully submitted,
W. B. Griffin, *Secretary*.

CALENDAR OF COMING EVENTS

Meeting, New York Section, Downtown Athletic Club, 19 West St., New York City, January 12th, 1945. Symposium on "Recent Developments in Dye Application and Their Use in Textiles."

Speakers: Paul R. Meunier, E. I. du Pont de Nemours & Co., Inc., "The Pad-Steam Continuous Dyeing Process"; Paul J. Choquette, General Dyestuff Corp., "Recent Developments in the Dyeing of Synthetic Fabrics"; Henry E. Millson, Calco Chemical Division, American Cyanamid Co., "Current Aspects of Interest in Wool Dyeing."

* * *

Meeting, Philadelphia Section, Hotel Philadelphian, Chestnut at 39th St., Philadelphia, Pa., January 12th, 1945. Speaker: J. D. Bettridge, Owens-Corning Fiberglas Corp., "Fiberglas."

* * *

Meeting, Northern New England Section, January 26th, 1945.

* * *

Meeting, Rhode Island Section, Providence Engineering Society Hall, 195 Angell Street, Providence, R. I., January 26th, 1945.

A New Method for the ANALYSIS OF PREVENTOL GD in Vat and Mineral Dyed Textiles

DMITRY A. SHIRAEFF
General Dyestuff Corporation

THE compound known chemically as 2,2' - dihydroxy - 5,5' - dichloro - diphenylmethane, has been found to be a rather efficient mildew-proofing agent. On account of its rather lengthy name we will refer to it as Preventol GD throughout this paper.

The present official method for the determination of Preventol GD on textiles is too long, and it requires special equipment and highly trained operators. The few laboratories which are in a position to carry out this method are insufficient to take care of the tremendous amount of analytical work which is called for. The textile mills, loaded to capacity, are forced to seek newer and more productive methods for the application of Preventol GD. But such research is constantly defeated by the lack of a reasonably short and simple control method to guide them in their work. The recent attempt to mildewproof and to waterproof filling yarn in a package dyeing machine serves as a good illustration. Here it was essential to ascertain the distribution of the Preventol GD throughout the package; to find out whether even distribution is possible; to find out whether Preventol GD possesses a definite affinity for cotton; to find out the effect on this affinity of different chemicals used in the process and to find out the influence of temperature, etc. All this results in an ever increasing number of samples to be analyzed and an ever increasing louder and louder cry for a simpler and shorter method of analysis.

Preventol GD, being dihydroxydichlorodiphenylmethane, presents the following possibility for the analytical attack on this chemical.

1. Determination of the organically bound chlorine which element is a constituent of this compound.
2. Analytical utilization of the phenolic properties of this compound.

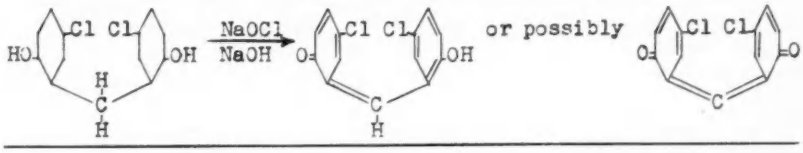
The present official, and only, method for Preventol GD is based on the determination of chlorine by the H. H. Willard and J. J. Thomson procedure for *The Micro Determination of Halogens and Metals in Organic Compounds* (J. Am. Chem. Soc. Vol. 52, page 1893, 1930).

In our search for a new and simpler method, we have concentrated on the investigation of the phenolic reactions of Preventol GD. These present the following three possibilities:

(A) Coupling with diazonium compounds.
(B) Formation of colored iron complexes.
(C) Color reactions with bleaching powder.

The first two we discarded as unpromising. The rate of coupling of Preventol GD with diazo solutions is too slow for quantitative purposes. The reactions based on iron complex formations are not very sensitive or distinct and would require a somewhat involved procedure. The reaction with bleaching powder turned out to be very successful, and we have based our new method on this reaction.

Small amounts of hypochlorite in an alkaline solution of Preventol GD produce a very intense yellow color. The depth of the color is proportional to the concentration of Preventol GD. 0.25 mg. of Preventol GD in 50 cc. of solution is easily detectable, fading slowly away only in the course of several days. We had no chance to investigate the chemical mechanism of the reaction but we believe that through oxidation Preventol GD acquires an ortho-quinonoid structure, perhaps in the following manner:



PROCEDURE

Apparatus

10-cc Micro-burette
100-cc Beakers
100-cc Volumetric flasks
Glass funnels, 75 mm. diameter
Set of 50 cc high form Nessler's tubes, with a tube support (Eimer & Amend Catalogue No. 7-065)

Chemicals

2.5% Caustic Soda solution
Chlorox (Commercial Sodium Hypochlorite)
0.2% Solution of Preventol GD in 1% Caustic Soda solution
Preventol GD Reagent which is prepared by adding 5.0 cc of Chlorox to one liter of 2.5% Caustic Soda solution. This reagent should be prepared fresh every day.

A. Analysis of Preventol GD Solutions

Dilute the unknown solution to an approximate concentration of Preventol GD of about from 0.02 per cent to 0.2 per cent. Measure 10.00 cc of the diluted unknown solution into a Nessler tube, bring up with the Preventol GD reagent to the 50-cc mark. Place the Nessler tube into a 2-L. beaker ¾ full with hot water and, placing the beaker over a burner, bring the water in the beaker to boiling. Remove the Nessler tube from the beaker and compare it with a set of other Nessler tubes similarly treated but containing instead of the unknown solution known amounts of standard 0.2 per cent of Preventol GD.

From the above it should logically follow, that for an analysis of Preventol GD on textile material one would extract Preventol GD with a caustic soda solution and proceed in the same manner as before. But it was precisely at this point where we encountered the greatest difficulties.

Extracting cotton goods with hot caustic soda solution results in a reduction of vat dyestuffs through the reducing action of cotton itself. Preventol GD extracts from dyed materials were so stained that colorimetric comparisons with the standards were impossible. The success of the method, as applied to textiles, became dependent at this point on finding an agent which would prevent bleeding of the dye without interfering with the complete extraction of Preventol GD and which would not interfere with the reaction itself.

After a long and fruitless search for such an agent we have found that our Preventol GD reagent (a dilute solution of sodium hypochlorite in caustic soda)

is the very agent we were looking for. The reducing action of cellulose is completely stopped by hypochlorite. Besides, we have found also that the oxidized form of Preventol GD is extremely soluble in caustic soda solutions, thus insuring a rapid and complete extraction of Preventol GD from textiles. Below we are giving the procedures for the analysis of Preventol GD in mildew-proofed textiles.

B. Analysis of Preventol GD on Textile Materials

Procedure A

This procedure is used when a sample of material treated with Preventol GD and a sample of the same material not treated with this chemical are both available.

Weigh 0.500 g. of the treated material cut in small pieces and place it in a 100-cc beaker. Add to the beaker 35 cc of the Preventol GD reagent; place the beaker on a hot plate or over a burner and bring the contents to boiling. Stir the material vigorously with a glass rod. Remove the beaker from the hot plate as soon as it begins boiling. Decant the solution into a 100-cc volumetric flask, leaving the material in the beaker. Add to the beaker another 35 cc of the Preventol GD reagent, bring the contents to boiling, decant the solution into the same 100-cc volumetric flask. Repeat the last operation once more. These treatments will remove all of the Preventol GD from the material. Cool the 100-cc volumetric flask to room temperature and bring the volume up to the 100-cc mark with the same Preventol GD reagent. Mix the contents of the flask well and filter through a dry 15-cm. No. 5 Whatman filter paper into a 125-cc Erlenmeyer flask. Transfer 50 cc of the filtered solution into a 50-cc Nessler tube and compare it with the standards.

The standards are prepared by treating the 0.50 g. of material originally containing no Preventol GD in exactly the same way as the unknown but to each sample of which a known amount of Preventol GD has been added.

Thus, if the Nessler tube containing the solution of the unknown is weaker in color than the sample to which 5 mgs. of Preventol GD were added but stronger than the one to which 4 mgs. of Preventol GD were added, then the 0.5 g. of the unknown contains less than 5 mgs. but more than 4 mgs. of Preventol GD and therefore the material under analysis contains about 0.9 per cent Preventol GD.

The standards can be prepared in steps of 0.5, 1,2 or 4 mgs. depending on the accuracy desired and the ability of the operator to distinguish the variations in the shades of the color.

The variations in shade are sharpest when the concentration of Preventol GD is from 2 mgs. to 10 mgs. per 100 cc of the solution. Therefore when an expected per cent of Preventol GD on the sample is from 0.4 per cent to 2 per cent, 0.500 g. of sample should be taken for analysis. When the Preventol GD content of the goods is much higher, the sample should be reduced to 0.300 g. or 0.250 g., or the volume should be increased from a 100-cc volumetric flask to a 250-cc volumetric flask.

Procedure B

This is used when only goods treated with Preventol GD are available.

The procedure is the same with the unknown but the standards are prepared by weighing half as much of the same material as in the case of the unknown and adding to this the known amounts of Preventol GD. After matching the unknown with the standards thus prepared, the amount of Preventol GD in the goods can be found by the use of the following inequalities:

$$\tfrac{1}{2}x + y_1 < x < \tfrac{1}{2}x + y_2$$

where x = mgs. Preventol GD in sample
and y_1 = mgs. Preventol GD added to the standard which is weaker than the sample
and y_2 = mgs. Preventol GD added to the standard which is stronger than the sample.

The above inequality can be solved for x

Thus, using an example when a solution of Preventol GD from 0.500 g. sample of goods lies between two standards, each of which contains 0.250 gm. of the same sample but one containing 2.0 mgs. Preventol GD added and the other 2.5 mgs. then,

$$\tfrac{1}{2}x + 2 < x < \tfrac{1}{2}x + 2.5$$
$$x + 4 < 2x < x + 5$$

Therefore the value for x lies between 4 and 5 mgs., or x is about equal to 4.5 mgs. and since x represents the amount of Preventol GD in 0.500 g. sample, the goods contain 0.9 per cent Preventol GD.

Presence of identical textiles in the standards with which the unknown sample is being compared is imperative since differently dyed and finished materials change slightly the hue of the yellow shade of the oxidized form of Preventol GD.

TRADE NOTES • NEW PRODUCTS

• CORRECTION

Re: List of Manufacturers of Dyestuffs

In the list of manufacturers appearing on page 539 of our December 4th issue, the name of the Althouse Chemical Company of Reading, Pa., was unintentionally omitted. As is well known to our readers, the Althouse Chemical Company is one of the oldest manufacturers of dyestuffs in the United States.

• COMMENCEMENT EXERCISES, PHILADELPHIA TEXTILE

Commencement exercises of the Philadelphia Textile Institute will be held in the school auditorium at 3 P.M. on Thursday, February 1, 1945. H. Wickliffe Rose will deliver the commencement address. The textile school Alumni Dinner will be held in the evening.

• NEW POLYHYDRIC ALCOHOL

Trimethylolpropane, a polyhydric alcohol, is now commercially available from the Heyden Chemical Corporation. The product is a crystalline waxy solid with the following properties:

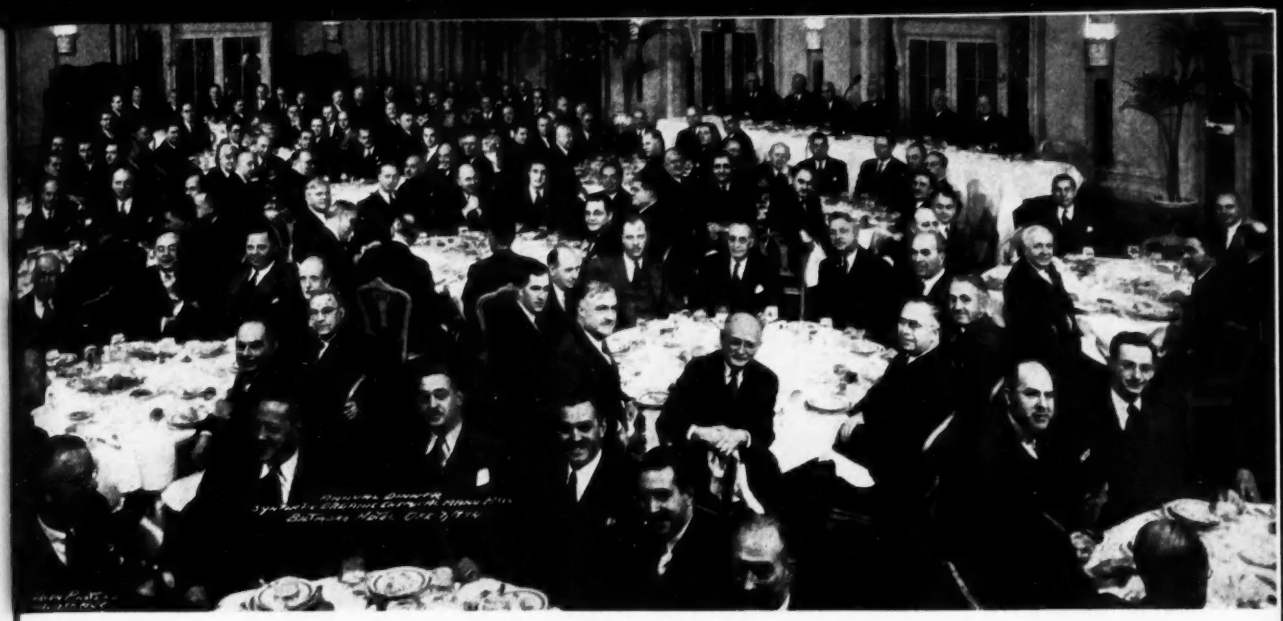
Formula	$C_6H_{11}(OH)_3$
Molecular Weight	134.17
Hydroxyl Content (% OH)	33.5% 1.0%
Combining Weight	50.8
Color (Gardner)	11
Solubility, grams per 100 grams solvent at 25° C.	
Water	all proportions
Ethyl Alcohol	all proportions
Glycerol	all proportions
Benzene	0.02
Acetone	71

Trimethylolpropane has already found uses in making low viscosity drying and non-drying alkyd resins. These alkyds have shown application in the manufacture of textile printing pastes and impregnants. TMP is also used in the manufacture of synthetic drying oils, rosin esters, coating compositions and plasticizers. In general, resins and oils made from trimethylolpropane show wider solvency and compatibility than corresponding compounds made with other polyhydric alcohols.

Esters made with rosin and trimethylolpropane are soluble in mineral spirits and have good compatibility with drying oils and nitrocellulose so that they may be used for the preparation of spirit lacquers, oil lacquers, and nitro-cellulose lacquers. TMP resins are said to have considerably higher stability to light than the usual ester resins from rosin and other polyhydric alcohols.

• ANSUL CHEMICAL COMPANY ANNOUNCEMENT

Ansul Chemical Company, Marinette, Wisconsin, announces that its owned and operated subsidiary, Dugas Engineering



AMONG THOSE PRESENT AT ANNUAL DINNER OF S. O. C. M. A.

• ANNUAL MEETING, S.O.C.M.A.

The twenty-third annual meeting of the Synthetic Organic Chemical Manufacturers Association was held at the Hotel Biltmore, New York City, on Thursday, December 7th, 1944. The executive session was called to order at 5:00 P. M.

The following slate of officers was elected for the coming year:

President—Dr. August Merz, Calco Chemical Division, American Cyanamid Company.

1st Vice-President—Dr. Elvin H. Killheffer, E. I. duPont de Nemours & Co., Inc.

2nd Vice-President—V. E. Williams, Monsanto Chemical Co.

Board Members—Dr. Wyly M. Billing, Hercules Powder Co.; Harold W. Dingee, Zinsser & Co.; Ralph E. Dorland, Dow Chemical Co.; Dr. Eric C. Kunz, Givaudan-Delawanna, Inc.; C. M. Richter, Pharma Chemical Corp.; Dr. Harold L. Simons, Harold L. Simons, Inc.

Following the business meeting, a social hour was held, prior to the dinner. The members and guests were welcomed to the dinner by President Merz. During the dinner, Dr. Fred G. Zinsser, of Zinsser & Co., a former vice-president and board member of S.O.C.M.A. for many years, was elected an honorary member of the Association.

The speaker of the evening was Dr. Amos E. Taylor, Director of the Bureau of Foreign and Domestic Commerce, whose subject was: "New Forces in International Economic Relations."

The next regular monthly luncheon meeting will be held at the Chemists' Club, New York City, on Friday, January 12th, 1945.

Corporation became the Dugas Division of the parent company on Oct. 1, 1944. The change, which conforms with Ansul's postwar development and future planning program, encompasses the complete operations of Dugas. It also makes possible a measure of simplification and standardization.

In the five years since Ansul became the sole owner and operator of Dugas Engineering Corporation, the product, Dugas fire extinguishing equipment, has become widely known and used, it is stated.

• TEXTILE RESEARCH INSTITUTE OFFERS RESEARCH FELLOWSHIPS

The Textile Research Institute's program of graduate training began Nov. 1, 1944. Through this program, the Institute will offer a number of research fellowships. The fellows will have an opportunity to work toward their Doctor's Degree at Princeton University, and also to do research work in the laboratories of the Textile Research Institute at Princeton, N. J. Those accepted as fellows will receive $700 per year, and the Institute will also pay the graduate tuition fees.

Prospective fellows are invited to send inquiries concerning the program to Dr. Henry Eyring, acting director of Fundamental Research, Textile Research Institute Laboratories, Princeton, New Jersey.

• AMERICAN INSTITUTE OF LAUNDERING CHANGES

Arthur I. Anderson has resigned as manager of the A.I.L. department of Research and Textiles, and Carlyle G. Morton, formerly assistant to Mr. Anderson, has been promoted to manager of the department, George H. Johnson, Executive Vice-President and General Manager of the American Institute of Laundering announced recently.

Mr. Anderson's long association with the A.I.L. started in 1928 when he was appointed junior fellow by the Mellon Institute of Industrial Research, which at that time conducted the laundry research for the American Institute of Laundering.

When the A.I.L. consolidated its service departments in the new national headquarters building in 1930, Mr. Anderson came to Joliet as assistant manager of the department of Research and Textiles. He became manager of the department in 1938 when George H. Johnson assumed the general managership of the A.I.L.

A graduate of Lowell Textile Institute, with extensive experience in the textile industry, Mr. Anderson has become well known in both the laundry and textile fields. His future plans will be announced shortly.

Carlyle G. Morton, the new manager of the Research and Textiles department has been a member of the A.I.L. research staff for nine years and is well qualified both by education and experience to carry on the important work of the department.

• PROCESSING OILS & CHEMICALS ASSOCIATION MEETING

The annual meeting of the Processing Oils and Chemicals Association, Inc., was held at the Hotel New Yorker, New York City, on October 17th at which Officers and a Board of Directors were elected for the coming year and many matters of current interest to the industry were dis-

cussed. Officers elected were Fred C. Scholler, President; Victor H. Berman, Vice-President; H. B. Sweatt, Secretary-Treasurer. The new Board of Directors consists of F. C. Scholler (Chairman), Ernest Nathan, L. L. Grombacher, L. E. Schroeder, H. B. Dohner, H. A. Harrison, G. A. Goulston, V. H. Berman, A. J. Royce, J. M. McChesney, C. M. Braham, D. S. Whiteman, P. E. Breer.

The meeting was largely devoted to a discussion of the present raw material situation and conditions that may be expected to exist in the post-war period. It was the consensus that while most raw materials were in easier supply at this time it might be some time following the end of the European phase of the war before normal conditions could be expected.

● NEW MATHIESON PRODUCT

Sodium methylate, a versatile reagent for organic synthesis, is now commercially available as the result of a process developed by The Mathieson Alkali Works, it is announced by R. E. Gage, Director of Research and Development. Heretofore, users of this product have had to prepare it in solution as needed.

The process developed for its manufacture utilizes sodium amalgam produced by the Castner electrolytic cell which Mathieson has used for many years to produce caustic soda and chlorine, according to Mr. Gage.

The new product is a dry white powder containing "a minimum of 95 per cent of sodium methylate, not over 2 per cent of inorganic alkalies (sodium hydroxide and sodium carbonate) and not over 3 per cent of methanol." It is packaged in air-tight containers and is said to be stable as long as it is not exposed to the air.

The compounds of commercial importance which may be made by methods involving the use of sodium methylate include pharmaceuticals, perfumes, metallic soaps, dyes and organic intermediates.

● CALCO BULLETIN

"Wool Shrinkage Control with Lanaset" is the subject of technical bulletin No. 766, announced by the Calco Chemical Division of the American Cyanamid Company, Bound Brook, New Jersey. The bulletin describes the properties of "Lanaset," the trade-marked name of a melamine resin manufactured by the American Cyanamid Company, as well as the manner of application and wool shrinkage control as a result of mill trials. Copies of the bulletin may be obtained by writing to the company at Bound Brook, N. J.

● NEW SERIES OF ACETATE DYES

Tennessee Eastman Corporation announces a new series of acetate dyes said to have exceptional fastness to sunlight in its line of Eastman Acetate Dyestuffs. This series, designated as LF, will include reds, greens, blues, oranges, browns, yellows, violets, and pinks.

First in the new series is Eastman Fast Yellow GLF. This dye produces bright shades of neutral yellow on acetate rayon and nylon. Dyed in pastel shades on cellulose acetate rayon, 25- to 40-hour light fastness is obtained; and in heavy shades, light fastness approaches 240 hours, it is stated. Yellow GLF dyes over temperatures ranging from 130° F. to 190° F. It is said to exhaust rapidly and level exceptionally well, and it may be used on either jig or box. It leaves cotton and viscose rayon white and is suitable for cross dyeing.

Eastman Fast Violet 5RLF is the second dyestuff in the LF series. An anthraquinone dyestuff, it dyes cellulose acetate a reddish shade of violet which is said to have outstanding fastness to sunlight. A somewhat bluer shade, with good light fastness, is produced on nylon. Violet 5RLF dyes at 160° F. to 190° F. and is recommended for both box and jig dyeing.

In addition to its new LF series, Tennessee Eastman has brought out a new azo blue dyestuff, Eastone Blue BGF, which is said to be exceptionally fast to gas fading. Eastone dyestuffs are those in the Eastman Acetate Dyestuffs line which are dischargeable, as well as usable for plain dyeing.

Eastone Blue BGF is said to dye and level at somewhat lower temperatures than azo blues previously offered to the trade. The manufacturer does not recommend that the new dyestuff be used on highly twisted fabrics at temperatures below 180° F. It is, however, recommended for fabric constructions that will withstand processing at 180° F. to 190° F. and, according to the company, will produce shades which are highly resistant to atmospheric gas fading on those fabrics. Blue BGF may be used on either a jig or a box.

● CHLORINATED SOLVENT

Trichlorethane, now available in commercial quantities from Carbide and Carbon Chemicals Corporation, a Unit of Union Carbide and Carbon Corporation, is a colorless volatile liquid that is said to be soluble in ether, alcohol, and most organic solvents but is difficultly soluble in water. This chlorinated compound is said to show unusual solvent powers and can readily be converted to vinylidene chloride for use in the manufacture of synthetic resins. It is a good solvent for cellulose acetate, natural rubber, certain types of synthetic rubber, and most oils, fats, and waxes, it is stated.

"Technical Information" sheets on trichlorethane are available. To obtain a copy, it is suggested that the reader write Carbide and Carbon Chemicals Corporation, 30 East 42nd Street, New York 17, N. Y. and ask for Form 5565A.

● WESTVACO PROMOTIONS

W. H. Williams, V. P. Production, Westvaco Chlorine Products Corporation announces the appointment of Warren R. Philbrook as Industrial Relation Director, and Fred S. Rooney as Acting Manager of Westvaco's Carteret, N. J. Plant.

Mr. Philbrook joined Westvaco in 1933 soon after graduation from Stanford University. After serving in the production departments of Westvaco's Modesto, Calif. and South Charleston, W. Va. plants, he became manager of the Carteret, N. J. plant three years ago. His new duties will include supervision of Industrial Relations at all Westvaco plants.

Mr. Rooney has also been associated with Westvaco for more than a decade, joining a West Coast subsidiary soon after graduation from San Jose State College. For the past year he has been located at Westvaco's New York Office as an Assistant to the Vice President in charge of Operations.

● MOVES TO LARGER QUARTERS

Karl M. Herstein announces the removal of Herstein Laboratories, Inc. to

Karl M. Herstein

larger quarters at 23 West 47th Street, New York 19, N. Y.

● APPOINTED DIRECTOR OF RESEARCH

Dr. Gerald J. Leuck has been appointed Director of Research, of Glyco Products Co., Inc., Brooklyn, N. Y. Dr. Leuck received his Ph.D. at Northwestern University and was formerly with The Miner Laboratories of Chicago, where he did considerable work on carbohydrates and their derivatives, proteins, polymers, adhesives, etc.

In his new position, he will complete and extend the postwar problems instituted by the Company. In this connec-

tion, he will form a new Research and Development Laboratory, staffed by chemists with extended experience in the paper, leather, textile, rubber, paint and plastics industries.

• CHEMICAL INDUSTRY MEDAL AWARD

The Chemical Industry Medal for 1944 was presented on Nov. 10 to Colonel Bradley Dewey, President of Dewey & Almy Chemical Company, Boston, Mass. and former Rubber Director, at a joint meeting of the American Section of the Society of Chemical Industry, the New York Section of the American Chemical Society and the New York Section of the American Institute of Chemical Engineers, held at the Hotel Roosevelt, New York City. The Chairman of the American Section of the Society, Dr. Norman A. Shepard, presided.

Mr. Charles Almy, Vice President of Dewey & Almy Chemical Company, spoke about the personal side of the medalist's life, Dr. Vannevar Bush, President of the Carnegie Institution of Washington, told of Colonel Dewey's scientific and technical accomplishments and Dr. Karl T. Compton, President of the Massachusetts Institute of Technology addressed the meeting on the medalist's part in educational matters. The medal, which may be awarded annually for valuable application of chemical research to industry was presented to Colonel Dewey in recognition of his work in colloid chemistry, especially as pertaining to rubber latex, and his accomplishments in administering the synthetic rubber program during the critical war period. The presentation was made by Dr. Foster Dee Snell following which Colonel Dewey gave an address on "The Role of Organized Research and Business in American National Defense."

• LEEDS & NORTHRUP BOOKLET

Any industrial man who has a problem which must be solved through the use of measuring instruments and controls, should be interested in Leeds & Northrup Company's recent publication, which briefly describes all L&N products for regulating plant processes.

Because so many of these processes depend on close temperature regulation, one section of this 28-page "General Catalog" issue of "Modern Precision" describes the instruments for measuring by each of L&N's four pyrometric methods: Thermocouple, Rayotube, Thermohm and Optical. For other plant processes, equipments which measure such quantities as pH, speed, gas analysis, etc., are described. A large chart shows the particular instrument model which is available in each case . . . installation photographs show the equipments in service.

Another section is devoted exclusively to a discussion of L&N heat-treating furnaces, with a page describing and illustrating each method: Vapocarb-Hump Hardening, Homocarb Carburizing, Homo Nitriding and Homo Tempering. Also described, in still another section, are the L&N laboratory instruments.

Copies of this publication may be obtained by writing Leeds & Northrup Company, 4934 Stenton Avenue, Philadelphia 44, Pennsylvania. Please be sure to specify Folder ENT(7a).

• DU PONT ORGANIZATION CHANGES

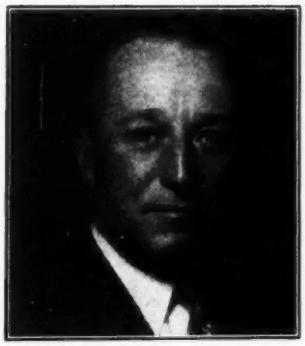
F. H. Weismuller has been appointed director of sales of the Pigments Department, E. I. du Pont de Nemours & Company, it was announced recently. Mr. Weismuller, who was production manager, succeeds John F. Daley, recently made general manager of the department.

R. A. Kaiser, assistant production manager, will succeed Mr. Weissmuller, and C. E. Rossee, manager of the Baltimore, Md., pigments plant will be transferred to Wilmington to become assistant production manager.

C. E. Smith, in charge of silica gel operations at the Newark, N. J., plant, will succeed Mr. Rossee.

• JOINS TURNER HALSEY CO.

Emmett Driscoll recently joined the executive staff of Turner Halsey Co., 40 Worth Street, New York City. He had



Emmett Driscoll

previously been with the Sayles Finishing Plants, Inc. for 21 years. He is well known to REPORTER readers as chairman of the New York Section of the American Association of Textile Chemists and Colorists.

• TO TRAVEL IN LATIN AMERICA

Robert L. Skov, who is in charge of the sale of industrial chemicals in Latin America for Hercules Powder Company, will leave January 5, on a six months' trip to distributors of the company's chemicals in thirteen countries.

Mr. Skov's trip will take him to Mexico, Guatemala, Nicaragua, Canal Zone, Venezuela, Colombia, Ecuador, Peru, Chile, Argentina, Uruguay, Brazil, Trinidad, Puerto Rico, and Cuba.

New product developments in the insecticide, paint, varnish, lacquer, textile and plastic industries will be discussed by the Hercules representative.

Mr. Skov is a graduate civil engineer of the University of California, speaks Spanish and Portuguese and has traveled extensively in South America.

He was in charge of West Coast sales of Hercules Naval Stores, synthetic resins, and cellulose products prior to being placed in charge of sales for Latin America.

• NEW TYPE OF PIGMENTED EMULSION

A new type of pigmented emulsion for use in printing and dyeing textiles is covered by U. S. Patent No. 2,364,692 granted, Dec. 12, to Norman S. Cassel, vice-president and technical director of Aridye Corporation, and assigned to Aridye Corporation, Fair Lawn, N. J. The patent also covers the method for producing this type of emulsion. The new type of emulsion is known as a three-phase emulsion and is said by the inventor to employ a novel physical structure that offers distinct advantages in printing and dyeing with pigments. Emulsions previously known to textile chemists consisted of two phases—an aqueous phase and an oil or lacquer phase. The three-phase emulsion consists of one continuous phase and two dispersed immiscible phases.

The original Aridye patents covered emulsions of water in pigmented lacquer, and the application of these for coloring textiles. Later it was discovered in the Aridye Laboratories that the best results could be obtained if the pigment were first dispersed in a concentrated resin solution, and then dispersed in the continuous lacquer phase. This resulted in a three-phase emulsion: (1) a continuous phase consisting of an unpigmented low-solids-content lacquer, (2) one dispersed phase consisting of an aqueous fluid, and (3) a second dispersed phase consisting of a concentrated pigmented resin-solvent aggregate. The low-solids-content lacquer consists essentially of a binding agent and an organic solvent. Preferably, the binder should be one which is originally soluble in an ordinary organic solvent, and which can be converted into an insoluble state after heating. One suitable type of resin solution mentioned in the patent is an alkyd resin dissolved in petroleum solvent. The aqueous fluid usually is water.

Another type of three-phase emulsion covered by the patent is one consisting of an outer continuous aqueous phase and two dispersed organic phases.

After the application for this patent had

been made, the Aridye Corporation decided that rather than withhold the development from the market until the patent issued, it would include in its licenses granted to textile finishers the right to use this new type of emulsion. This was done, and pigment colors suitable for application in three-phase emulsions were marketed.

Introduction of the three-phase emulsions to finishing plants permitted shipment of pigment colors in more concentrated form than had been possible previously. Another advantage of this development from the viewpoint of the textile printer or pigment dyer is said to be that the use of the three-phase emulsions results in less effect on the hand of the finished fabrics. Still another advantage is said to be that concentrated pigment colors can be diluted to the desired shade with a low-solids unpigmented clear without danger of causing flocculation of the pigment.

Many of the textile printers in this country and a number of dyers are now applying pigmented emulsions to textiles under licenses granted by Aridye Corporation. The license, which is available to any textile finisher, calls for the payment to Aridye Corporation of a royalty equal to six per cent of the cost of the compositions used by the licensee under the license. Development of the three-phase emulsion is another step in Aridye's continuing program of "Pioneering with Pigments."

• AWARDED SECOND STAR

Smith, Drum & Company, of Philadelphia, manufacturers of textile and laundry machinery, have recently been awarded their second star for continued excellence in war production. This company was originally awarded the "E" pennant at ceremonies held at the plant on August 10, 1943.

• G.E. CHEMICAL DEPARTMENT

A new department in the organization of the General Electric Company, to be known as the Chemical Department, has been created by the Board of Directors and Dr. Zay Jeffries, technical director of the company's Lamp Department, has been elected a vice president in charge.

President Charles E. Wilson stated the creation of the new department to become operative January 1, was in accordance "with the company's policy of modifying the organization structure to enable us to take full advantage of our opportunities for further growth."

The new Chemical Department will assume responsibility for the operations pertaining to the Resin and Insulating Materials Division and the Plastics Division of the Appliance and Merchandise Department.

• DCAT OFFICERS

The Drug, Chemical and Allied Trades Section of the New York Board of Trade, composed of over 500 firms in these industries, recently elected the following officers to serve during the next fiscal year: *Chairman* — Guy L. Marsters, vice-president, The Norwich Pharmacal Company; *Vice-Chairman*—Harold M. Altshul, president, Ketchum & Company; *Treasurer*—Robert B. Magnus, vice-president of Magnus, Mabee & Reynard, Inc. (re-elected); *Acting Secretary*—Miss Helen L. Booth, The New York Board of Trade, Inc. (re-elected). Carl M. Anderson, assistant to the president, Merck & Co., Inc. was re-appointed Counsel.

The retiring Chairman, E. T. T. Williams, chairman of the Executive Committee, Becton, Dickinson and Company, automatically becomes a member of the Section's Advisory Council which consists of the ex-chairmen for the past five years.

• ASA ELECTS OFFICERS

The re-election of Henry B. Bryans, executive vice-president and director of the Philadelphia Electric Company, as president of the American Standards Association, was announced at the Annual Meeting of the Association at the Hotel Roosevelt, New York, on December 8th. Mr. Bryans has already served one term as president and has been a member of the Board of Directors since 1941.

Other officers of the American Standards Association for the coming year will be: *Vice-President:* George S. Case, chairman of the Board of the Lamson and Sessions Company (re-elected); *Chairman, Standards Council:* H. S. Osborne, American Telephone and Telegraph Company (re-elected); and *Vice-Chairman, Standards Council:* E. C. Crittenden, National Bureau of Standards (re-elected).

• PURCHASE TEXTILE FINISHING

H. W. Butterworth & Sons Company, Philadelphia, manufacturers of textile finishing machinery, anounce their purchase of The Textile Finishing Machinery Company, Providence, R. I. The plant at Providence will be continued in operation as a Division of the Butterworth organization under the management of Edward Wharmby who, for many years, has been associated with the purchased company. "The additional production facilities acquired through this purchase will help us materially in relieving our already overburdened manufacturing organization" says Harry Butterworth, president, "and will put us in a better position to supply the tremendous shortage in textile finishing machinery."

After November 1943, The Textile Finishing Machinery Company went into receivership and was acquired by Jacob Ziskind. Realizing that the textile manufacturers of the world would soon feel the shortage of finishing machinery, and with the idea of saving the industry, Jacob Ziskind approached the Butterworth organization. He found them in full agreement with him as to the situation. The Textile Finishing Machinery Company was acquired by Butterworth on December 7, 1944.

• CONTINUOUS PEROXIDE BLEACHING PROCESSES

Two continuous peroxide bleaching processes—among the more recent outstanding contributions to the textile industry—are described in a profusely illustrated 24-page, two-color booklet just released by the Electrochemicals Department of the du Pont Company.

Prepared by the Peroxygen Products Technical Service staff with the cooperation of officials, engineers, chemists and operators of textile mills and equipment companies, the booklet details both pictorially and editorially the application of the two processes—the continuous "rope" system and the continuous "open-width" system. The illustrations include installations already in operation, "three-dimensional" drawings of the steps in the processes, and diagrams showing power, steam, and solution control systems.

Although the equipment and method used in the processes are new to the textile industry, it is stated that information in the booklet is based on mill experience which has been gained by successfully bleaching hundreds of millions of yards of cloth in several leading American textile mills.

The du Pont continuous bleach system is essentially an arrangement of saturators, cloth heaters, J-Boxes or other storage devices, and washers. In both the open-width and the rope continuous bleaching systems the cloth is prepared as usual, saturated with caustic soda, squeezed to eliminate the excess chemicals, heated to optimum operating temperature by passing through a new type du Pont cloth heater, stored in an insulated stainless steel J-Box for one hour, then pulled out and washed. The cloth is then saturated with an alkaline peroxide solution, passed through a second cloth heater, piled in a J-Box for bleaching, washed, and pulled to the white bin.

The new continuous bleaching processes are offered by du Pont to textile mills as a contribution to the industry. The company sells no textile equipment but does manufacture peroxides for the continuous bleaching system — "Solozone" DFF dustless and free-flowing sodium peroxide, and "Albone" 100-volume electrolytic hydrogen peroxide.